THE FOUNDRY

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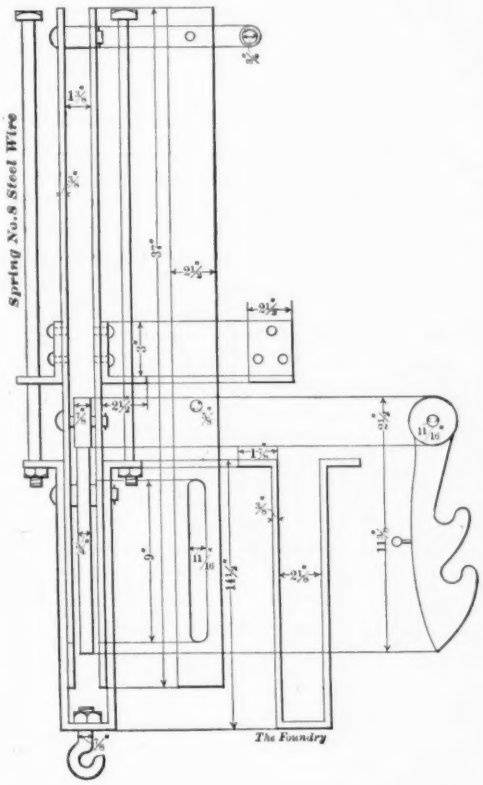
A Spring Lifting Hook.

In our September issue John Gunther, foreman of the gray iron department of the Walter A. Wood Harvester Co., St. Paul, Minn., showed some of the methods in vogue at that plant, for conveying material Among other things Mr. Gunther mentioned



a spring hook in use on their trolley tracks, by which a ladle could be raised or lowered within certain limits to conform to the hight of the mold. A great many inquiries having been made concerning this, the author has kindly forwarded us a blue print from which we have reproduced the annexed illustration.

Mr. Gunther writes that in their malleable department the spouts on the melting furnaces are nearly level with the floor, and in order to empty the ladles into the molds the ladles must be elevated six inches above the position occupied while receiving the metal from the furnace. With a ladle holding sufficient iron to pour three couplers the first mold is poured with the ladle at the same height at which it leaves the furnace; when the second mold is reached the ladle is with the aid of the spring-hook raised three inches, and an equal distance when the third and last mold is reached. Without the aid of this spring-hook on the trolleys, through which all iron and material is distributed, the first mold would have to be poured from such a height, as would likely cause the metal to scatter and cut up the gate, resulting in more or less dirt finding its way into the casting.

In the gray iron department of the same company, the spring-hook is used for the purpose of aiding in the emptying of the mixing ladle which holds enough metal to fill three of the ladles in use on the trolley tracks, the latter having a capacity of about eight hundred pounds each. These spring-hooks can be made of different lengths to suit height of tracks or other conditions, and heavy or light to correspond with the amount of iron they are expected to carry. In the present instance the springs are made of sufficient strength to just counterbalance the weight of the ladle when empty. In pouring, those who are performing this operation also raise the ladle when this becomes necessary.

Overhead tracks should always run past the cupola or furnace, so that in case the cupola tender fails to stop up the tapping hole, one ladle can follow another, which cannot be done on a stub track. In the construction of overhead trolley tracks, curves should always be used in turning corners, turntables being not only too slow in operation, but also unsafe.

Think Before You Close Your Flask.

BY ELI H. PEARCE.

I have heard a great deal said, and read a great deal more, on the subject of the molders shortcomings, and while I am free to admit that we can all stand improvement, still all things considered we are not as black as we are painted.

Thomas D. West in his Text Book says, "Perfection in molding can only be reached through rigid attention to trifles, close attention to small things, together with the exercise of good judgment."

Trifles neglected leave chances to be taken which is where luck comes in. Trusting to luck is like a lottery; you can win, but the chances are that you will lose.

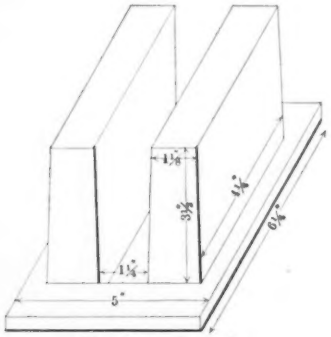


Fig. 1

After you have lost a casting some one else can always tell you where you were in error, after you have already located the trouble yourself.

I seldom wait until a casting is lost to point out an error likely to occur, but several days ago I gave a pattern, like Fig. 1, to a young molder, and told him that I wanted a casting made from it.

I happened to be near when he went to cut his gate, which he cut as in Fig. 2, leading the iron into the mold on one side, thereby filling up the pocket A before the pocket B received any metal, causing the green sand core to give way to the pressure of iron and ruining the casting.

As the casting was small and in no hurry, I said nothing until he went to pour it. Then I told him that after it was shaken out I should expect him to explain the cause of its loss.

He looked rather cheap when he brought it to me with the remark that it should have been gated at the end.

One moment's forethought would have told him this before he cut his gate, and had it been a rush job his lack of thought would probably have caused a delay.

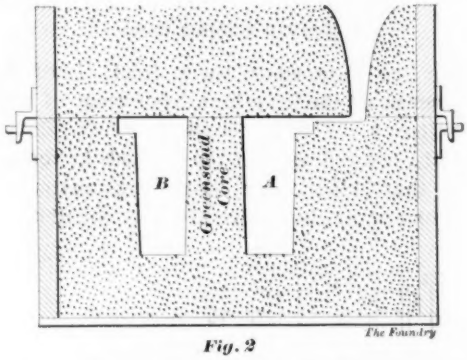


Fig. 2

My old boss had a motto that is still green in my mind, and I believe it well to repeat it. After a heat was off he would make us cubs bring him all our bad castings and tell him why they were lost. If we could not advance the right reason for our loss he would explain it to us, but if we did tell him the proper cause he would say, "My boy, that is an afterthought and is very light compared with forethought, for an ounce of forethought equals one hundred tons of

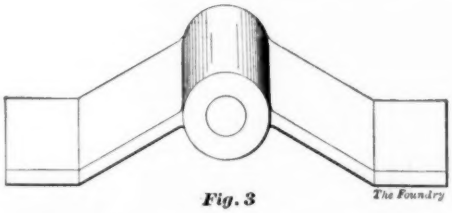


Fig. 3

afterthought. Learn to think before you close your flask."

Good advice. How many castings are lost by lack of forethought! In a jobbing shop is this especially true, for there is hardly any two jobs alike, and a molder must do some special thinking for each different job. Many times, if he would only remember his failures on jobs entirely different, but where the same principle was involved, he would be better prepared to make the piece before him.

Some time ago I gave a molder a pattern to put down that had a hole cored through

it, as shown in Fig. 3. Without thinking he gated it in the eye of the casting. When the iron was poured in it struck the core, washing it and causing a large hump in the bore. Next day we had a "rushed" job in the shape of a steam boat engine crank to turn out, and this same man molded it. Imagine my disgust when I found that he had cut his gate in such a manner as to let the iron strike the core, and washing it away, causing a bump that took over an hour to chip out.

While speaking of the molders, I must say that they, as a rule, do as well as most other workmen, and I must not neglect to give the foreman his little pill to swallow, for we are often to blame more than our men, inasmuch as we will take great pains to instruct the man on some point that he is well posted on, and neglect to tell him things that he is ignorant of. We are none of us perfect, and we should keep a sharp look out that we do not feel our greatness too much and neglect some of the trifles. I know that I for one make mistakes sometimes, and if you wish proof of it please look on page 93 of the November FOUNDRY, and there you will see that I forgot to put my cores in the hub of that balance wheel.

Uniform Metal.

By R. H. PALMER.

On breaking up some bad castings of say 2 inches thickness one sees sometimes as it were two different kinds of iron in the piece, the lower half being dense, while the upper half will be more open, and the iron looking as though it needed something. Sometimes these effects may be neutralized by using an additional brand of iron. While I do not mean to imply the simple act of stirring the iron in the ladle would overcome the objection and cause the two different layers to mix, I have always obtained more satisfactory results by having a ladle, that would hold some 800 to 1,200 lbs., under the spout of the cupola, tapping into this, and pour from it into the smaller ladles used for the side floor and bench work. In pouring heavy work it will be found that a good stirring up of the iron in the ladle will be very beneficial.

In casting test bars I have often found a difference between them that surpised me, and watching a molder pouring I noticed him take the iron from the tapping ladle, carry it to his floor, skim it off, wait a minute or two, then pouring one, after which he looked at the iron another minute or two, and then poured the other. The consequence was, that the next morning when the test bars were broken, I went to him and asked, "Did you pour both of those bars from the same ladle?" "Yes, sir." "One right after the other?" "Yes, sir."

No doubt the man was perfectly honest in his answers as he understood it.

In waiting the length of time he did, and pouring the second test bar with a duller metal, he was pouring the iron under altogether different conditions, and, as I expected, there was a marked difference in the breaking strain of the two bars. The next day I had the molder take the metal from the tapping ladle, and cooling it to the temperature required for our ordinary work I stirred the iron with the skimmer, and he poured one, another quick stir, and then the other. On breaking these two test bars there was no such amount of difference as had previously occurred.

While I am aware a great many foundries use a tapping or mixing ladle the majority do not.

I have been told that English foundries have their cupolas so arranged that the iron as fast as it melts enters a covered tank, from which the metal is then drawn instead of being tapped directly from the cupola.

Cast Iron Dies.

By R. I. CLEGG.

Many who, like myself, have had the task of cutting steel tools for sheet-metal work, must have longed for a reverse process to the one described in a recent number of the "American Machinist"; where, it will be remembered, an up-to-date molder got out a fine, clear cast-iron copy of a souvenir medal —in short, instead of cutting a hob or die directly out of the solid steel, to use a pattern of wood, wax or plaster, and cast the tools.

To a certain extent this is done very successfully, and being aware that the process is not any too well known, I send the following particulars, gleaned from shops where such dies are in daily use.

These shops, by the way, manufacture sterling silver ware, and it is noteworthy that the shop that sends out punch bowls for battleships spends less on the simpler dies than another shop making water and lard pails, tin cans and the like. To be sure, this is due largely to the profuse variety fashion demands in articles of the precious metals as compared with zinc, tin and sheet-iron goods, where the immense quantity supplied at a narrow profit implies more uniform styles and shapes.

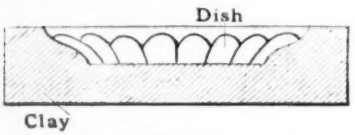


Fig. 1

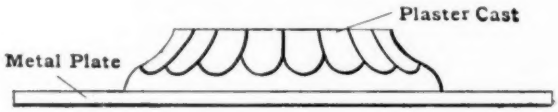


Fig. 2

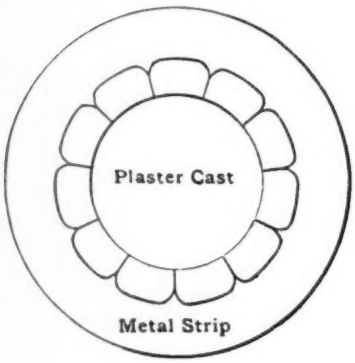


Fig. 3

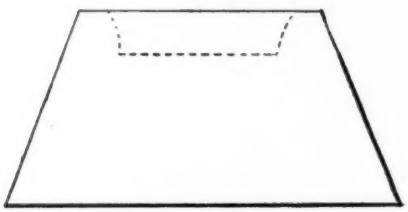
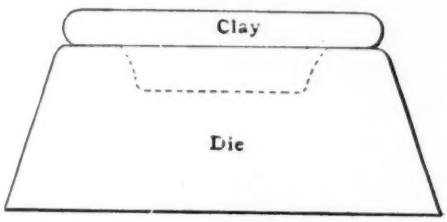


Fig. 4



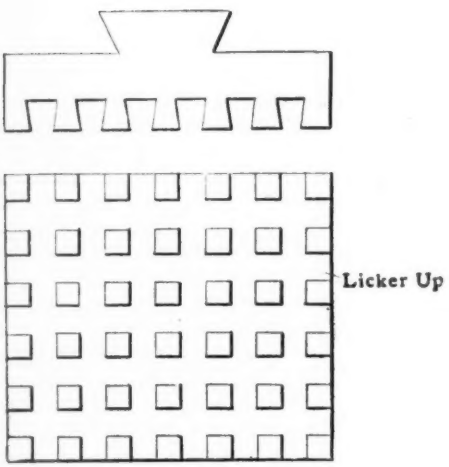


Fig. 5

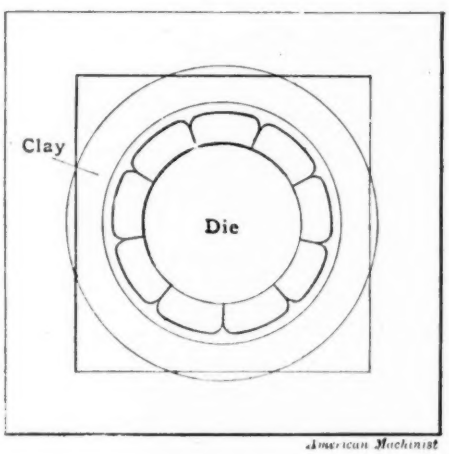


Fig. 6

A shop of the latter kind makes a pail in which the thin base is strengthened by a series of corrugations radiating from the center like the spokes of a wheel.

My attention was called to the die which puts in the flutes, and certainly it was a remarkable job. The shop does have a drill press and a couple of lathes—only this and nothing more; the die, therefore, was an exhibition of cold-chisel planing. I took it for granted that a "force" was used in connection with the die, but have since had a suspicion that, perhaps, that convenience might not have been in vogue there. If the die was carved out by the cold chisel, the two halves complete, I know of no tougher task, provided the time is limited. Such plain, straight work is easily milled; but first catch your milling machine, and, lacking that, you must go back to more primitive methods.

Information as to shop practice among jewelry firms and silversmiths is, as a rule, difficult to get; the Gorham Manufacturing Company, however, state as follows:

"We do use many cast-iron dies in our business, and find the metal very useful, enabling us to make inexpensive dies to produce articles having general features that are quite plain, or that have little ornamentation, and that of a soft character. But for the manufacture of spoons, forks or other articles to receive a higher state of ornament, where great force or pressure is required to produce the results, cast iron is totally unfit for the duty."

Ornamentation of a soft character obviously means but slightly raised, or low relief, and without sharp lines.

The J. B. & S. M. Knowles Company, makers of sterling silverware, through the treasurer, Mr. Burwell, inform me that: "We use cast-iron dies quite largely for dishes from 3 to 12 inches in diameter. The largest dish we make is about 12 by 16 inches. This dish weighs about 24 ounces, and is gotten up with a 600-pound hammer."

Although familiar with dies in a general way, the writer has never made a pattern for a cast-iron die, and the description I shall give of the method has been provided by an expert silver worker. Cast-iron dies for stocking up silver hollow ware are made about as follows, or at least this is an easy way to make them:

Hunt up a lot of crockery catalogues and find the dish shapes you want. You will be able to secure a loan of the dishes. Take the dish and surround it with clay, pressing the dish down into it. Build your clay up a very little higher than the dish edge, and flare to prevent undercutting (Fig. 1.) Pour into the dish, as into a mold, plaster of paris, and let it stand until set. Now with an old knife and rough rasp smooth off the bottom —i. e., the part uppermost after pouring. Before you do this, however, it would be wise to take out the cast, otherwise there is danger of breaking your original model. Now find level bench with true metal plate, and upon the metal plate place your cast, which has been nicely shellacked to prevent sticking (Fig. 2). Take a strip of sheet metal and make a shallow tunnel of it, large enough to surround your cast, and leave from 1½ inches upwards of leeway, as in Fig. 3. Tie a string around the rolled-up sheet metal. Now pour in your plaster; the amount depends upon the size of your dish; this is determined, of course, by experience. When the plaster is fairly hard, untie the string and take off the metal band or tunnel and smooth off your new cast bottom; turn it over with first cast still in place, and trim it up to suit your idea of how little iron is necessary, making the base larger than the top, etc. Some men are very skillful in this line, and will take out their casts when about the consistency of cheese and whittle and carve away in a remarkable manner.

The thing when nearly ready looks like Fig. 4. Brown & Sharpe do the casting and chill the top, which is now sent to the die cutter to be finished and polished, and often ornamented upon the rim.

Of course nice ware is touched up very often after being struck. I am told that Gorham makes teapots in this way one-half at a time.

Now in regard to the "force," all you have to do is to fasten a slotted piece of iron in hammer of drop—known as a "licker-up"—(Fig. 5), and, after putting your cast-iron die on the bed of the drop, roll up a lump of clay until it looks like an eel; oil it, and place it as in Fig. 6.

Now pour in your melted lead and tin mixture. When set, but hot, take away your clay eel and bring down your hammer. The "licker-up" will pick up the lead "force," and one or two raps of the hammer will shape the lead well into the die.

In regard to striking the ware, it is of advantage to force one or two pieces of sheet brass into the die in order that the stock may not be cut in the first few strokes. The

work will require frequent scraping (to take off bits of lead) and annealing before it is down to the brass. Now take out one of the brasses; strike medium blow. Scrape, anneal, look over and "pickle." Take out last brass, bring down "force" by one or two good raps, carefully wipe out die and strike again. If not up, anneal, pickle and strike again. This kind of work requires frequent annealing, varying according to depth of die.

The "force" mentioned above is of the softer kind. Sometimes "forces" are required much harder, and are cast of various bronze mixtures to fit the job in hand. For some purposes, as in the manufacture of jewelry and metal novelties—hand or foot press work—the "licker-up" is dispensed with, and the force is cast with a tenon, which is turned to fit the socket of the press.

Probably the cast-iron die may not displace the steel die beyond a very limited extent; but I am sure the description of its use and capacity, the molding and pattern making incidental to getting out the die and tools, will be novel, if not indeed very useful, to many readers of the "American Machinist."

A Little History.

In view of many conflicting stories now published as to wars that are scheduled to come off between iron ore and steel making interests, especially since the resignation of H. C. Frick from the Carnegie Steel Company, a few facts may be interesting. In order to give these, a little history will be necessarily in order. Eight years ago H. W. Oliver, of the Oliver & Snyder steel interests at Pittsburg, leased a large mine on the Mesaba range. Mr. Carnegie, then as now head of the greatest steel making concern of the world, was not inclined to go into the mining business, but a short time later he changed his mind. Mr. Oliver's representations, Mr. Carnegie's finally settled conviction that the Mesaba range was so enormous that no future discoveries could ever shake the safety of investments in its mines, and the tempting offers made by the Oliver interests, who found themselves sorely in need of funds to carry on the development of the properties they had secured, resulted in the organization of the Oliver Mining Company, in which the Carnegie Steel Company took a five-sixths interest and the Oliver & Snyder Steel Company the remainder. The new company, backed by unlimited funds, at once began the purchase of mines and mineral lands, and soon extended its scope beyond the Mesaba range, over all five Lake Superior ranges, picking up at low prices the very choicest mines and lands. It was practically alone in this business for two years, and so had the field to itself, thus having opportunity to gain the best at prices that now seem absurdly small.

When the Oliver company took under lease from John D. Rockefeller the Mountain Iron Mine of the Mesaba range it agreed with Mr. Rockefeller that it would ship its ore from that and other specified mines over his road and in his ships, to a minimum amount of 1,200,000 tons, and this contract brought into being the Bessemer Steamship Company, a Rockefeller concern, now the third largest steamship organization on the face of the globe. Certain other agreements passed between the two interests, relative to their business, important among which was a clause that Mr. Rockefeller should not become a competitor of the Carnegie Steel Company in the manufacture of steel. Though at the time this agreement was made the Rockefeller interests had in mind the erection of a vast steel making plant, and had actually proceeded so far as to purchase a site for it, this agreement has been religiously adhered to, and neither Mr. Rockefeller nor his money has become associated in the making of steel, except in the way of loans on good security.

Then the wave of combination passed over the country, led by the association into the Federal Steel Company of the varied interests of the Minnesota Iron Company, the Duluth & Iron Range Road and the Illinois Steel Company, these three forming an association similar to what Messrs. Rockefeller and Carnegie would form were they joined. Then were organized the National Steel and the American Tin-Plate, two closely allied concerns, and the American Steel Hoop, also closely associated with the two last mentioned, and the American Steel and Wire. A portion of these, with the Carnegie Steel Company and the Federal Steel, would have combined into one a great portion of the steel billet, rail, beam and general trade of

America. Mr. Frick then broached to his chief the idea of such a giant combination, but Mr. Carnegie flew the track. His company was the biggest and needed no such alliances. It was still Mr. Carnegie's hope to continue it as the giant steel-making firm of the world, and he did not want to lose individuality in any combination; besides, he as usual correctly gauged the temper of the American people, and doubted the effect of any such organization as his daring colleague proposed. But he did do this: He gave his associates, headed by Frick, an option on his interests in the Carnegie Steel Company; announced that the remainder of his life was to be spent in philanthropy, and went to Scotland. Frick proceeded to business. W. H. Moore, of Chicago, who had been instrumental in forming some of the preceding combinations in steel, took the actual handling of the formidable and tremendous deal, and publicly announced that subscriptions would be taken in various cities for the new Carnegie Steel Company, and did actually receive some such. A charter was obtained in New Jersey with such a capital that the public became alarmed, and the project lagged. Then Judge Moore was suddenly left hanging in air, and those interested with him got out from under. That any such scheme was in mind was denied by authority, and the whole matter dropped. Mr. Carnegie returned to the United States, the option was canceled on its expiration, the forfeit taken by Mr. Carnegie and a reorganization effected in the Carnegie Steel Company. This let out those who had been most active in the negotiations. Mr. Frick became a "consulting partner," as said the official statement, "the same as Mr. Carnegie and others." Mr. Carnegie then announced that the Carnegie Steel Company had "just began to grow," a unique way of saying to those who might be considering the question of opposition that they better watch out. Now, when the National Steel Company was formed the Oliver & Snyder interests were taken by it, steel plants and ore rights. So that Mr. Oliver's power in the Oliver Mining Company is reduced to a minimum, the ore divisions in that concern being five-sixths Carnegie and one-sixth National Steel.

To-day it is reported in newspapers that Frick and Rockefeller are going into steel making in competition with Carnegie. They cannot, unless the Rockefeller contract with Carnegie is abrogated, and Mr. Rockefeller does not care to do this. It is also stated in the same communication that Frick, Mellon, Rockefeller and Oliver control the Mesaba. That is an egregrious mistake. So far as any one interest can control the Mesaba, that interest is the Carnegie Steel Company. Practically all the Mesaba's ore in sight is held by this company, the Federal Steel, the Rockefeller interests, the American Steel & Wire and certain Ohio Valley steel-making interests. Of these various holdings, that of the Carnegie Company is so far in the lead as to be rivalled by none. And it is constantly strengthening its position by buying mines, not only on the Mesaba, but on all other ranges as well. There are two links in the chain from raw ore to finished steel that the Carnegie Company has not possessed, these being lake tonnage and the rail transportation from mines to Lake Superior. A great fleet of ships is now under construction for the company and a charter for a railway in Northern Minnesota has been obtained. The company has what no competitor controls so far, a modern and high-grade railway from Lake Erie to its furnaces. As one answer to the talk of competition, this road is now being double-tracked.

In any fight for supremacy in the iron trade of America carried on west of tide-water the five Lake Superior ranges are the key to the situation. No steel maker to-day, thanks to Mr. Carnegie and Mr. Oliver, can hope for success unless he controls ore in quantity. The whole matter resolves itself into this question. How much ore can be had by any new rival at such a price as will permit competition with concerns that have already secured enough to last them generations? The big mines of Lake Superior that are not to-day in the control of one or the other of the present steel-making combinations, aside from the Rockefeller holdings, can be counted on the fingers. Mr. Frick has a location in the west for a large steel plant, and is likely to erect great mills and furnaces. But it can be set down as a fact that Rockefeller is not with him, and that the Carnegie Company's relative position is not affected by whatever is likely to result. Its stores of ore in the ground have been selected with the requirements for every class of steel-making in mind. It has Bes-

semer ores to a larger extent than any rival, has vast stores of ore suitable for making open hearth steel, a quality that so soon as the present excess demand is over may push Bessemer from its position, and has whatever is necessary to make any steel under the best and most economical mixtures. It would be impossible for any new rival to come into the market and secure, without the expenditure of vaster sums than are readily available, any such ores as are in the hands of the present great companies.—Boston Transcript.

Some Pertinent Questions.

BY M. ANDERSON.

In a recent issue of the Iron Molders' Journal, "Ironmonger" asks some questions that are of more or less interest in that they affect the cost of production and the quality of the castings. I have numbered these questions, which are as follows:

(1) I would like to know why a molder will beat a new flask with a square-edged clamp, when he is shaking out, until he loosens the pins, and then uses nails to stop the cope from shifting?

(2) Why will he get new nails for his joints when the foreman is not looking, and old ones when he is?

(3) Why will he cool his iron, when he wants good finished work, and pour grates with hot iron?

(4) Why does he use "sojers" in a narrow core, when he knows that they will swell and split the core and spoil the casting? Why not use rods made of old feeding iron?

(5) Why will he put a crooked core in a bolt hole when he knows the bolts are straight?

(6) Why do so many of them ram a pattern up without sufficient bearing for the cores, and wonder why it is crushed under the print?

(7) If a mold drops or sticks down, why do so many men slobber the place with water when the sand is wet enough, and when the casting is blown or "cold shut," say, "Oh, the sand was wet." If they know the sand is wet, why do they use it? If it drops, "Oh, the sand was too dry." If too dry, why do they use it? Is there any reason why a man should lay a core across a mold without a rod in it, when he knows there ought to be one in it?

(8) Why do so many men let a new box burn by having a run out, and then make the same casting in an old box without any trouble? Why will they lead the vent off at the joint of a wooden box and burn the whole joint, when they could lead it up through the cope? Why will they let their partners stand waiting for a lift until the foreman comes in and says things?

(9) Why do they look at a brother straining himself, turning a shank, and not lend a hand? Why do they steal the gaggers instead of making some? Why don't they help a boy to get along instead of cursing at him?

Sometimes I feel as if "Ironmonger" could answer several of these questions in a way that would be satisfactory to his own conscience. However, as I feel guilty of having done the majority of the things enumerated, I may as well give my reasons for actions on my part that were not strictly orthodox.

(1) The reason I beat flasks, both new and old, with a square-edged clamp when shaking out, is because there is only one sledge in the shop and there is about fifteen people who want to use this at the same time I do. These people are built heavier than I am, hence I let them keep the sledge, which I would not do if I could help it, because a clamp is a mighty poor instrument to shake out a flask with.

I have had several foremen tell me that the proper way to shake out a flask was to hit the sand and not the flask. I can advance no arguments against this theory, as I feel that as a theory it is all right. In practice, however, I know that nothing makes the sand fall out faster than to hit the flask a few good licks with a heavy sledge, or in case the sledge is missing, a heavy clamp or any other medium through which considerable force can be transmitted. I know this has a tendency to not only loosen the pins but also the bars, but as I have only got ten minutes before the whistle blows, and the company does not pay for overtime, I feel that I am not in duty bound to donate my own time in order that the company's flasks may last longer. I will promise to be more careful if sufficient time is given me to shake out, but as long as the blast is held back till the last moment I am going to get through just as quick as I know how, and whatever damage is done at night can be repaired in the morning. I don't think myself that nails form a very scientific method for keeping a flask from shifting, but the fact is that when a pin is loose neither screw-driver nor monkey-wrench can be found without a visit to the machine shop. As the end justifies the means, and the object is to save time, I grab the first spike I come to, drive it into the joint of the flask and let those who have more time than my-

self hunt for the screw-driver and practice the ideal way of keeping a flash from shifting.

(2) The reason I get new nails when the foreman is not looking is because of my inborn habit of getting through life as easy as I can. The old nails are kept in an old pot in one corner of the shop and they are mixed together in all sizes along with pieces of scrap iron, core rods and rocks from the claywash buckets, not to mention the sand. Now if I want fifty twelve-penny nails, I think it will cost the company more to have me pick these out of the old nail pot and straighten them than it will to give me new nails. I may have to swipe the latter, but somehow or another I feel that I am sinning as much for the company's benefit as my own.

(3) I most always make it a point to pour grate bars with good hot iron because I must. Some designs have got to be poured very slowly and very hot or else the cores will tumble over. The reason I pour other castings with a dull iron when a hotter metal would be better is because our foreman likes a nice-looking casting. Dull iron will not burn into the sand like hot iron. If our company would buy a first-class article of plumbago we could pour hot iron and have nice castings too.

(4) The reason I use "soldiers" in a narrow core instead of rods is that the former will hold better. Every molder will bear me out in this. Iron rods are heavier and require a deeper cope than soldiers. The way to keep a soldier from splitting a core is to let them swell before using them. This can be done by leaving them for an hour or so in contact with water. If a molder will look ahead a bit he can easily attend to this before he stars to ramming up his drag. By the time he is ready to put on his cope the soldier will be done swelling and can be used with safety. Molders should always look ahead as far as they can.

Many of the cases where a casting is supposed to be lost from a soldier swelling this does not really take place. The real cause is that the molder rammed his sand too hard around the soldier, which, coupled with poor venting, will cause the sand to scab off until the soldier is reached, when the wood is blamed for the whole trouble.

(5) Whenever I have set a crooked core in a bolt hole, it has been because the coremaker only made the exact number of cores required, when it became a question of using what cores were furnished or let the casting go over until the next day. The majority of castings are wanted "to-day."

(6) Every molder has got to acquire the greater part of his knowledge through experience. This explains why he will some time or another neglect to take account of the weight which the core prints of his mold must carry. Again a pattern will be made with such short core-prints that the molder is compelled to resort to the utmost ingenuity to keep the core in its proper place, not only as regards the crushing of the drag side of the mold but also against crushing the cope part during casting. The reason why some firms are always losing castings from one cause or another is because they place no premium upon experience.

(7) It is but human to offer excuses. Perfectness is never attained. It is also in the natural course of humanity to take chances. This explains why a molder will set a core in a horizontal position without insisting upon it being rodded. Again one shop may use a core sand mixture of sufficient strength to carry a core without rodding, while another shop employs a weaker core sand. In changing from one shop to another a molder may for once overlook the difference. He cannot exactly be expected to be an encyclopedia for two dollars and a half a day. If he knew half of what some people expect him to know he would be occupying a chair at Yale or Harvard.

(8) The reason why some molders will make a casting in an old flask without any trouble and have a run-out the first time they use a new one is because with the former they must be on their guard, while the latter makes them feel secure and incidentally brings about neglect.

It is a question whether it is not sometimes better and a more economical procedure to lead the vent off at the joint, even if the flask is charred a bit at this point. There are many castings made where it is impossible to have the cope fit the core with sufficient exactness to prevent the iron from capping the cope side of the print, and in such cases I think it is perfectly proper to lead the vent off at the joint. While an outlet for the vent could be made through the cope by digging out the sand at this point and ramming it up again after the mold is

closed, it is to be borne in mind that this method requires time and often considerable care.

The reason some molders will hang back when it comes to giving their partners a lift is because the foreman has got no system of running his shop. It is possible that several more laborers should be employed by that particular shop or else hoists provided, but in any event, where lifting must be done by main strength and awkwardness, the foreman should see that a certain number of men are detailed for this work. It is his business to do so, while it is not a molder's business to jump up and run every time someone yells for a lift, unless he has been told to assist in this respect on certain floors.

(9) I am of the opinion that when a molder is obliged to strain himself turning a shank, he is doing work that should be placed on a crane floor. I have seen more or less iron spilled around the feet of those who were helping to hold up, and I know the position often becomes one of positive danger, which probably accounts for a lack of willingness to volunteer.

Wherever there is a shop in which the molders are compelled to steal gaggers in order to have any, the foreman does not know his business. This individual should make it his duty to see that enough of these articles are on hand. I know the making of gaggers is regarded in some shops as a matter of charity, but it is a kind of policy that does not pay the employer.

Some boys may not get the help they deserve. At the same time there are shops where apprentices are too numerous to be properly taught the trade. A couple of boys on a particular job will give a molder more to worry over than if he only had the job alone, because he is held responsible for their shortcomings. I have got nothing to say in favor of the molder who will not give the boy proper instruction if time is allowed him to do so; neither can I say anything against the man who, if furnished a time card, neglects a boy. It takes, as a general rule, a longer time to tell a boy how to do a thing than it does the molder to perform the operation itself. When shop managers turn their shops into kindergardens with the hope of saving money thereby, they should not hire molders, but instructors. A molder cannot do a full day's work of molding and teach the trade to several young ones at the same time.

The Passing Show.

By CHARLES BUTTERFIELD.

Of course the molder is not as good as he should be. By the way, he never will be. But if he is in need of instruction so also are those who employ him. At a recent meeting of the American Society of Mechanical Engineers one speaker is reported as saying that two hundred foundries were in need of competent foremen at the present time. This may or may not be so. It should always be borne in mind that there are a large percentage of foundries, just as well as establishments in other lines of trade, who are never satisfied and where the most competent foreman would fail to fill the bill.

Just what constitutes a competent foreman is a question that is open to considerable debate. In order that this may be better illustrated I append a number of queries propounded by one W. A. Rockwell, of Harriman, Tenn., who is gunning for a foundry foreman. If the southern foundries are in the habit of quizzing candidates in this manner, I can readily perceive why they change foremen often. Mr. Rockwell works his rapid information extractor in this way:

What is your age?

Have you a family?

Do you belong to any union, and if so, to which one?

Are you a good all round practical molder?

Have you had any experience in making plow work?

Do you know something of pattern work?

Are you an all around mechanic, and familiar with the work of a punch and shears and drop hammer?

How many men have you been accustomed to handling?

Where did you learn your trade?

Why do you wish to leave your present place, or why did you leave your last place?

What would you want as a salary to take charge of our foundry department, having under you from forty to fifty men?

We might want you to do some little punching and forging also.

Please give references.

Here is one of the two hundred positions

that are waiting for an occupant because competent men are so scarce.

Evidently our educational facilities are not keeping up with the procession. The different foundrymen's associations have at various times resolved, and that is about as far as they have gone, too, that they would change a boy from one job to another occasionally, and incidentally show him how to daub up the cupola and make a core or two, but none of them ever went so far as to propose to teach the other accomplishments which Mr. Rockwell seeks in a foundry foreman.

The man who can fill Mr. Rockwell's requirements will certainly earn his salary. I can almost see him handling forty or fifty men and doing "some little" forging and punching at the same time. The picture really makes me glad that I was not born twenty-five years later if the foundry business is going to demand that kind of foremen.

Seriously, the two hundred foundries who are unable to secure men who can fill the bill should form an association of their own. It would be one from which the text for many a fine object lesson could be taken.

Aluminum Zinc.

To make aluminized zinc, a quantity of aluminum is taken and placed in the bottom of the plumbago crucible. If it is desired to manufacture a 10 per cent aluminized zinc, the proportion would be ten pounds of aluminum. After the aluminum is melted, the zinc is added in small quantities at a time, being careful to keep the contents of the crucible well stirred. After all the zinc has been added to the aluminum, which in this case would be ninety pounds, the contents of the crucible is poured into molds or cast into forms of any convenient size for breaking up. These forms are generally ingots of a certain size, that weigh so many ounces apiece, so that the foundryman can add a given weight by simply counting the ingots without having to stop to weigh them. They may also be cast in the form of bars of a certain size that weigh so many ounces to the running inch.

Aluminized zinc is considered the best method in which to introduce aluminum into brass, and expert founders make a general practice of putting aluminum into brass when in the form of aluminized zinc. As has been frequently stated in these columns, it is not advisable to put aluminum in the brass which is to be dipped, and for this reason it is not advisable to make use of aluminized zinc. Aluminized zinc is generally made so as to contain 5 or 10 per cent of aluminum, in order that when a given quantity of the alloy is added it may be known accurately just what proportion of aluminum is put into the mixture. Aluminum brass melts at about the same temperature as ordinary brass. The presence of aluminum in brass causes it to harden a little more rapidly when being worked, but this hardness can be reduced by annealing the metal—that is, by heating the metal to a red heat and then plunging it into water.

In regard to the manufacture of small castings, the presence of more than a pound and a half or two pounds of aluminum to the ton of brass, will allow of a quarter, or a third more patterns being added to the gate, which would ordinarily be used for brass castings, than without the use of aluminum, as the presence of the metal in brass gives it such additional fluidity that it will run very freely in the mold, and allow the brass to take finer impressions and give a brighter surface than will otherwise be obtained.

When it is desirable to obtain a good brass casting, or brass sheet of a superior quality, it is necessary to use good, pure copper, and likewise zinc, together with a small percentage of aluminum. Copper of less purity and also a cheaper grade of zinc can be used, producing a strong casting, or sheet, as the case may be, at a less cost. If, however, too cheap a grade of zinc is used in castings, the presence of aluminum will cause the castings to appear dark on the surface. This is caused by the aluminum, which makes the lead, existing in the zinc in the form of an impurity, sweat out, but it is only caused when the poorest and cheapest quality of zinc is used. The aluminized zinc is added at the same time and in the same manner as ordinary zinc is added in the manufacture of brass, being careful, of course, to use it in such proportions that the resultant mixture will contain the desired amount of aluminum, which varies according to the purpose for which it is intended to use the brass. The use of very much aluminum in brass, in some cases,

tends to increase the shrinkage of the castings. This can be overcome, however, to a great extent by the use of large gates and high risers.

In the manufacture of brass, as well as aluminum brass, it is advisable to use a plumbago crucible over a coke fire. If coke cannot be easily obtained, coal oil will answer satisfactorily. A coal fire, however, will not allow of a very good grade of brass being manufactured, for the reason that the gases given off by the coal will be to a certain extent absorbed by the contents of the crucible.—Aluminum World.

Salisbury Iron in Demand.

The iron business is booming and the demand is so great that Barnum Richardson Co. have sold and shipped every ton they had on hand and have orders ahead for some 6,000 tons.—New Hartford (Conn.) Times.

Announcement is made of the organization of the New York Air Compressor Co. under the laws of the State of New Jersey. The capital stock of the company is $100,000, and a complete foundry and machine plant has been purchased on the line of the New York & Greenwood Lake Railroad, at Arlington, N. J. Contracts have already been let for a full modern equipment of tools. The company intends to manufacture a complete line of air compressing machinery at the new plant, and comprises the following officers: J. W. Duntley, president; Alexander MacKay, vice-president; W. P. Pressinger, secretary and treasurer. The New York offices of the company are at 120 Liberty street.

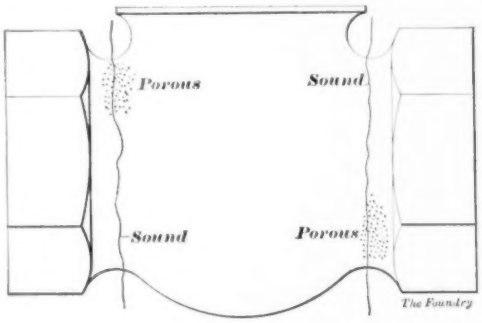
Porous Brass Castings.

How many otherwise perfect-looking castings are in reality defective is never known because they are not subjected to tests which would bring out these defects. Many a nice casting must be melted over again because it is perfect only in appearance.

One of our correspondents sends us a sketch of a small globe valve, made in brass, which causes trouble by porous spots appearing as indicated in the illustration. When subjected to a pressure of about seventy-five pounds a large number of these castings will develop a leak somewhere along the irregular lines drawn across each end of the valve.

A great many practical brass molders read THE FOUNDRY and we should like to have a number of opinions from them as to the seat of the trouble. Would the design of the valve, or in other words, would the hexagon formed portion at each end of the valve tend to produce this defect through an unequal distribution of metal?

Our correspondent writes that this complaint becomes particularly aggravating when the metal is either poured too hot or



too cold, and asks some of his craftsmen to tell him how they judge when their metal is in the right condition to pour. For steam metal he uses a mixture composed of 90 parts copper, 4 zinc, 4 tin and 2 lead. For yellow brass he employs an alloy of copper 67, zinc 33, melting this latter mixture to such a degree of temperature that it boils, producing a distinct vibration when a rod is inserted in the metal.

We shall be pleased to receive individual theories referring to brass work in general. The subject is one that has never been thoroughly covered.

Tough on the Cupola.

Between 8 and 9 o'clock last night fire was discovered in the cupola of the foundry at the Avery Planter Works, at the upper end of North Adams street. An alarm of fire from the box located at the plant, box 9, was quickly sent in by the watchman, and a prompt response made by the fire department. The fire was in a bad place to get at, but line after line of hose was laid as the fire machines reached the scene of the fire.—Peoria (Ill.) Journal.

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Trade Outlook.

But few persons would have dared to prophesy at the beginning of the year just closed that before its end it should become one of the most remarkable of the century. It has been marked by great changes, not only in the rapidly increasing value of every article consumed by mankind, but also for the evolutions in the management of industrial enterprises, which have been brought before the people with great force through the many enormous consolidations that have been completed during its three hundred and sixty-five days.

Whatever forecast one should undertake to make at the present time would be largely guesswork. There is nothing to guide a prediction of the future. A few months ago it was the accepted theory that pig iron could advance but little in value without causing an enormous surplus to be thrown upon the market, yet iron has doubled in value, and instead of a surplus we have had an actual shortage, even at these figures. This shows how little we can foretell what even a few months have in store for us.

As far as present indications are visible there is nothing to warrant the belief that an immediate change in values is at hand. While many melters of iron may strongly object to present prices, no relief can be offered them as long as others are eagerly buying everything in sight. As long as the pig iron leaves the furnace in a red-hot condition for the consumer, there can be little expectation of a fall in prices. When production overtakes consumption and stocks begin to accumulate, then we may reasonably expect a change.

The Successful Man Reads.

While it is true that a man may conduct most any kind of a business without the help of a trade paper, just like a person may travel without patronizing any of the modern conveniences provided for his comfort, it is also true that the best posted men in any trade consult their respective trade papers and profit thereby.

We occasionally come across a foundryman who claims that the reason he does not subscribe for THE FOUNDRY is because he has got no time to read it. Another will state that our publication is of no use to him. As our object is to please everybody connected with the foundry business, we have made it a point of following up these apparent failures of ours in order that we may do better. Making inquiries concerning one party who "did not have time to read," a disinterested person writes us that the foundry in question is having considerable hard luck with its castings. In another case where our publication was of "no use," we found that the party who advanced this opinion was unable to turn out a satisfactory casting and that work, which should be his, was being done a couple of hundred miles away on this account.

A trade journal will not exactly provide its readers with the set of brains which nature should have supplied in the first place, nor enable incompetents to amass fortunes. A trade journal is a helping hand, an assistant and a developer of current ideas. As such it is recognized by all successful men in every trade, and its advice is sought by the very people one would suppose knew it all.

One Way of Obtaining Good Men.

Mr. Augustus T. William, foreman of the Enterprise Mfg. Co. of Philadelphia, in a recent letter on this subject, said that he could see no reason why a molder, in leaving and going to his shop, should not be as neat and clean as a clerk working for less than half of the former's pay. Continuing, Mr. William says: "The way I manage to keep good molders is to treat them like mechanics. I have seventy-two molders, who are contented and competent, and, what is more, there is not a bum or a drunkard among the lot. It has taken eight long years to systematize our shop, but now everybody is well satisfied that the few dollars invested in bath rooms, dressing rooms and a few extra laborers to keep the shop in proper trim and relieve the molder of his more onerous work is amply repaying them in the shape of more work, better work and less scrap. While shops around us would lose several days during the summer due to hot weather, we have not lost a day on this account for two years.

"I have one more request to make from my employers, and then I am finished. I want to provide a dining room, wherein a warm dinner of good, substantial food shall be sold to the workmen at actual cost. All of our apprentices must work a while in the core room before they can begin in the foundry. A boy is not changed from a job until he is able to make it as well as a journeyman, when he is transferred to another. I would keep a stubborn boy on a job one year if necessary, but they all hustle, because the company allows them a bounty of ten cents on every dollar earned at the expiration of their apprenticeship, if they have been good boys. That we have been uniformly successful in the training of mechanics is shown by the fact that every apprentice who has graduated from the foundry of the Enterprise Mfg. Co. within the past eight years has drawn this premium for good behavior and attention to business. I may add that these apprentices have developed into men whom agitators cannot lead into doing anything which would tend to injure their own chances or those of their employers."

We cannot but feel that if more employers followed Mr. William's example they would have less cause for complaint. It should be noted that it has taken several years for the Enterprise Mfg. Co. to put their establishment on a basis which is satisfactory to all concerned. This should not be overlooked. Some foundrymen would try to work a revolution in their methods in three weeks.

A Couple of Questions.

One of our readers asks us to have someone contribute an article on annealing castings, the method employed and directions for getting up an inexpensive rigging for annealing in small quantities.

We are always glad to procure for our subscribers any information we can obtain relating to the foundry business. We are inclined in the present instance, however, to think that we shall not be able to give our inquirer a, to him, satisfactory reply. The annealing of castings, we take it for granted our correspondent refers to malleable castings, has been dwelt upon by several writers in this journal during the past year or two, although we want to say that the annealing of castings, like the molding of same, is something than cannot be learned out of books altogether. We should advise the seeker after knowledge on this subject, who expects to put it into practical use, to visit establishments where annealing is being done. A little reading matter is a good thing at all times, but for the man who wants to succeed in a calling there is nothing like rubbing up against the real work itself. This applies whether it is running a locomotive, a sausage factory or an annealing oven.

When it comes to giving directions for getting up an inexpensive rigging for annealing in small quantities we are again confronted with our inability to give our subscriber what he asks for. There is no such thing as an inexpensive rigging for annealing small quantities of castings. The very act of annealing castings that way is expensive. The most expensive rigging is generally the most inexpensive, that is when work performed and outlay is compared. However, if any of our readers will favor us with their methods of annealing castings in small quantities, we shall be pleased to publish same, although we caution our correspondent now, that the method will NOT be inexpensive.

The same party also desires to hear from those of our readers who have found a sat-

isfactory ingredient which can be put into a ladle of melted iron to remove the slag and impruities and insure a clean casting in such jobs as rolls and the like which must finish up clean all over and are rejected for the least imperfection.

There has at different times been several nostrums placed on the market of which a few spoonfuls were guaranteed to remove all imperfections that appeared in the casting. We have never heard of one of these medicines accomplishing what was claimed for it, and what is more, we do not expect to. The way to get a nice clean casting is to have nice clean iron. By this is not meant an iron free from impurities, because all cast iron contains more or less of these in the form of graphite, silicon, phosphorus, etc.; in fact, these elements are necessary in different proportions to obtain a casting of the quality sought. However, where a clean casting is wanted, and one that must be perfect, burnt cast iron, wrought iron and the like should be kept out of the mixture. With a suitable grade of pig and scrap iron a clean casting can be obtained if the iron is melted as it should be, when all unnecessary slag and impurities will rise to the surface of the metal where they can be skimmed off before pouring, and the mold is made right. This includes the proper method of gating, for after all that has been said on this subject it is surprising the amount of dirty castings that are caused by not providing a suitable method for the iron to enter the mold.

Taking it altogether, the art of making good castings is one that every generation will have to learn for itself. A vast amount of printed matter showing how to obtain clean castings has appeared within the past decade, and the greater part of this has been contributed by men who have had a fair success in turning out creditable work, yet after all the "knowing how" to do this is not nearly so universally distributed as one would suppose.

The Kranks Korner.

Coming down to fluxes, I believe Fluor Spar is a good flux, but I don't believe it is one bit better than limestone. Fluor spar is a little more talked about than limestone, because it must be advertised in some way. I would just as soon have the one as the other, the sole question being one of cost. If fluer spar was such a boon and its cost so low, blast furnaces would soon make a large demand for the product, instead of which they are sticking to limestone. All that fluxes are supposed to do is to keep the slag fluid, and limestone does this as well as any other thing.

* * *

Speaking of Fluor Spar recalls a story I heard of a foundryman's experience with this material. We will call him Shafer for short and let it suffice to say that his shop is not more than twenty-five miles from civilization. Shafer's shop does not use much of anything except scrap, which is obtained in exchange for a plowshare or two, the principal product of the shop, to which may be added an occasional order for sash weights. Shafer's shop takes off about two heats a year, the principal one being along in the spring of the year, when the leaves in the adjoining park are dry enough to furnish an economical fuel. The boiler of Shafer's shop leaks pretty badly and the majority of the flues are out of service and fitted with a wooden plug to stop the leak. I started talking about Shafer's experience with Fluor Spar and had to tell something about his shop in order that the reader should understand better how this came about. It might naturally be supposed that shops of this kind have passed out of existence, but they have not by any means. Well, a neighboring foundry burned down and among the contents saved was a barrel of Fluor Spar. Shafer had heard a great deal about the wonderful influence of it and explained to the neighbors what wonderful castings he was going to turn out. Shafer's cupola is made of staves and is low enough to be charged from the top of the stack. When Shafer got ready to run his heat he charged the whole barrel of Fluor Spar right onto his coke bed before putting in any iron. The result was, of course, that he melted the Fluor Spar first. Tapping out he secured pot after pot full of melted Fluor Spar, which he poured into sash weight molds under the mistaken idea that it was iron. When he shook out the molds these Fluor Spar castings fell to pieces as if they had been glass and Shafer swears to this day that the man that uses Fluor Spar is a damphool and does not know his business.

This was an actual occurrence and I have

related it here not to detract from the value of Fluor Spar, but to show what queer people one sometimes finds engaged in the foundry business.

* * *

A correspondent recently stated that he had considerable trouble with a soft coke, which was easily crushed, the blast not penetrating the charge, but finding its way up the outside, causing the lining to burn away more than usual.

Here it seems would be a good chance to use the center blast, in fact it has always seemed to me that one of the chief economies effected by the center blast would be the increased life of the cupola lining. Some people say that the lining cuts. That is a mistake. It melts. The blast itself does not wear it away. The blast increases the temperature, and in a cupola, methods of charging and subsequent rearrangement of the charge in settling, has much to do with the way the heat may be directed upon the lining of the cupola, and the consequent rapidity with which the lining melts away.

* * *

That the socalled Semi-Steel is only a form of cast iron and that the same results may be obtained without the use of boiler punchings, malleable scrap and the like is an explanation within the bounds of common sense. Semi-Steel is simply a purer iron, containing, among other things, less carbon, and as such it is more difficult to turn out solid castings therewith than with iron of normal characteristics, just like it is difficult to produce solid castings from pure copper. A small addition of phosporous, silicon or aluminum remedies the blowholes in copper castings, and a percentage of aluminum completes the same service for Semi-steel castings.

* * *

Within the past few years there has been more or less effort made to introduce a process for melting iron, which employs a steam pipe in each tuyere to distribute moisture to the blast as it enters the cupola. The claims for this process would cover more space than I care to fill, but among other things, one is for economy of fuel. I have always contended that if it paid to burn steam in the cupola it would be far more profitable to do so under steam boilers in general. How much there is in this claim may be judged from the following extract from a lecture on the "Blast Furnace," delivered by Mr. E. S. Cook, of Pottstown, Pa., at Columbia University:

"Atmospheric moisture plays an important part. It is never absent. It enters the tuyeres as vapor of water, calling for an increased amount of fuel to restore the heat absorbed by converting this vapor into its constiuent parts, oxygen and hydrogen. Whether the air contains five grains moisture per cubic foot or ten grains, either must be provided for by extra fuel or higher heat of blast, if the temperature of crucible is to be maintained. On an average for any one year, probably 125 pounds of water per ton of iron will be forced into the tuyeres in the shape of vapor, while during the humid summer months it may amount to 200 pounds and over. This is the reason why more fuel per ton of iron is required during the summer as compared with the winter months."

From the above will probably be seen the reason why the claims for the process mentioned have never been fulfilled. The only wonder to me has been that any practical foundryman should have taken enough stock in them to burn his fingers.

* * *

What can be said for and against the regular use of softeners in a mixture containing a very high scrap percentage? That is another question, someone has propounded. I don't believe it was a foundryman who asked it. There is nothing to be said for or against the use of softeners no more than anything could be said for or against one eating. When a mixture of iron is not soft enough either through the excessive use of scrap or a pig iron deficient in silicon, softeners must be added to obtain the desired result. There is no room for an argument on this subject.

* * *

Here is another "topical" question: What is your experience in regard to sand burning on castings so hard it must be chipped off? What causes it and what can be done to prevent it?

This may be a topical question, but I don't think for a minute that it was a topical foundryman who asked it.

If he was a foundryman at all, I think he was one engaged in producing light castings, and occasionally a heavy one to accommodate someone in the neighborhood. Of course he had molding sand suited for light work, and when that same sand sticks to the larger casting like a brother, he begins to ask questions.

The preventive for sand sticking to castings is to get the right kind of molding sand, and along with this to use some seacoal facing and plumbago. The evil may also be lessened by mixing some sharp sand with molding sand originally intended for lighter castings, but this does not make as good a sand as one that is suited to the work in the first place.

* * *

An account of how a casting is made is always more or less interesting, even if it goes too much into details by telling about "the pattern being vented by pushing a thick vent-wire perpendicularly down to the bottom board" or "the pattern is drawn and the mold well and carefully cleaned." Such sentences are for the kindergarden and the novice, for those who depend for their information on foundry matter upon book-learning altogether.

* * *

I read an article of this kind, one that tells every move to make in turning out the mold except to clean your floor, about making a large brass casting, a thousand- pound casting, by the way. I took it all in till it came to the pouring, where it said this was accomplished by using two 250-pound pots and one holding 70 pounds. If the contents of these three crucibles will make a thousand-pound casting there certainly must be money in running a brass foundry.

* * *

Economizing space often becomes an absolute necessity, though I have always been in doubt as to there being any economy in stinting on floor space, when it comes to running a foundry. I have seen both floor and snap molds stacked "three deep" in shops located where building lots were given away for building on them. Under such circumstances it is nothing but a piece of foolishness to crowd molders so close together that they do not have room to work.

I never saw it fail yet, that firms doing so lost more money in bad castings, due directly to the crowded condition of their foundries, than it would have cost to furnish extra room, ten times over.

Feeding or Compression of Metals.

BY EDWARD B. GILMOUR.

I have, with interest, read the controversy between Messrs. H. Ramp and William Roxburgh. My conclusions, from a large experience in this country and Scotland, is that cores do not feed castings directly, but that they play a very important part in feeding a casting, more especially those cast in dried molds, as when the gates are set, there is uniform resistance and the expansion of the cores increases the pressure upon the casting and makes it more solid; this is demonstrated by the bottom of the casting being more solid than the top; but this expansion ceases as soon as the casting begins to get hard, and with a casting of uneven thickness it is impossible to get it solid unless a feeding rod is used until it is set.

Mr. Roxburgh tells us of casting an anvil block of ten tons weight, and in order to get it solid he cast it open, and covered it with a carbonaceous compound, which gave excellent results. I am inclined to doubt this statement, as in the first place there was no pressure applied to the casting, and the top would be hollow and uneven, and would necessitate the planing of that surface in order to get it to lay level upon the blocks. I know that the largest steam-hammer builders in the city of Glasgow would positively refuse such a casting. I have personally cast three anvil blocks weighing twenty tons and over, and when the castings were turned out they were perfectly straight on the top, as we kept the cope three-eights inch high in the center, which allowed the casting to sag down as it settled; we had a twelve-inch riser in the center, and fed it with cast iron rods one inch square.

Mr. Roxburgh charges Mr. Ramp with having departed from the "good and old way"; and I am afraid that Mr. Roxburgh is like the man who put the saddle upon the horse because he saw another man put it on, without thinking for himself a reason for doing so, and if we were to adopt this system of imitation there would be no such a thing as progression, for it is better to think and be wrong than not to think at all.

He makes the assertion that the "more vegetable matter that a sand contains the better adapted it will be for the purpose of molding." This idea, among progressive foundrymen, has been discarded for over twenty-five years, and their experience has been that molding sand should be absolutely free from vegetable matter, as the more vegetable matter a sand contains the more

gas will be generated and the greater the liability of something to go wrong; hence necessitates greater skill and greater care upon the part of the molder. Mr. Spretson tells us that Mr. Babbitt uses old fire bricks which after, say ten years' service, have not changed color when he grinds them to a powder, and uses pipe clay as a binding material. He thus gets a pure refractory material, of which he makes his mold, which is heated to red heat before receiving the metal. It is said that no gas is generated, while casting, by this process. In Glasgow, Scotland, which is the cradle of loam molders, the mixture of loam is simply pure sharp sand and clay, and for greensand and drysand work they use pure rock sand, and these sands are perfectly free from vegetable matter, as the former is taken from the bed of the river, and the latter is rotten freesand rock, ground; and in some of the foundries they are using old bricks and the burned-up material from the castings ground in a mill with large rollers, with a slight addition of new material. This sand mixture is positively free from vegetable matter; if there had been any there originally it would have been completely burned out. I agree with Mr. Ramp in saying that horse manure, sawdust, and hay ropes are a thing of the past, although these materials are being used in some of the largest foundries in this country.

How They View Prosperity in New England.

Worcester men who own foundries are feeling a bad effect from the prosperity in the iron and steel business all over the country. Business is good with them, but the price of pig and scrap iron which they use in making their castings has more than doubled, and it takes more capital to do the same amount of business.

The men who have plenty of capital to work with are all right, for there is plenty of business for them to do. The great amount of manufacturing being done in Worcester now furnishes the foundrymen all the work they can handle, but what bothers them is to buy the pig iron to make their castings from.

Pig iron which was formerly $12 or $13 a ton is now $28 a ton. The price for the castings turned out from the foundries has, of course, been raised so that they are able to make a profit on the business, but it takes three or four months after the purchase of the pig iron before the returns come from the castings that are turned out of the foundry. If the foundryman has gilt-edged credit he is all right, but there are very few foundrymen in Worcester who can buy their pig iron on 90 days or four months' time. It is naturally to the advantage of the buyer to be able to pay cash, but when the price is over twice as much as it was formerly it makes the foundrymen hustle to get together the necessary cash to buy the raw material.

They buy some scrap iron for use in their foundries, but the price of this has gone up also. Where a ton of scrap iron is used in the foundry probably five or six tons of pig iron are used. The pig iron although it comes somewhat higher, is liked better than the scrap iron for use in the foundry. The pigs, as the bars of iron as they are smelted out from the ore are called, are much more easily handled and the time of the men is saved.

Ultimately the foundrymen will be able to do business as well as ever on the same amount of capital, but it will take some time to get used to the high price for the pig iron. When they have turned out their products and have been getting the pay for them at the increased rate for a while all will be beautiful for there is business enough and to spare.

There is no immediate prospect that the price of iron is to drop for the demand continues to far exceed the supply. There is a demand for iron in all stages of refinement, from the coarse pigs that are turned out and used by the foundrymen to the finest steel. It is estimated there will be 14,000,000 tons of pig iron smelted out from the iron mines this year, but this immense quantity will have to be increased before the men who use iron are to have their wants satisfied.

The immense demand for street railway rails has had no small part in the skyward tendency of prices. An order was recently placed for 150,000 tons, which is about two-thirds the whole supply of the year. There is a big demand for structural iron also, so that there is every reason to believe Worcester foundrymen will have to go on paying big prices for their pig iron, and be glad of the chance to get iron enough to fill their orders and supply their needs.

On account of the quantity of business on hand the foundrymen are tempted to take more work than they can get out. They do not like to see good orders go by, but they have not the capital to buy the pig iron they need to get out their work and it takes a lot of hard work to keep them going.—Worcester (Mass.) Telegram.

As Many Lives as a Cat.

It seems like several of the "improvements" invented to make the foundryman's life easier refuse to give up the ghost even after an inquest has been held and an official declaration made that the thing is really dead.

One of these metallurgical monstrosities that is persisting in showing signs of life is the "Doherty Process." The majority of our readers have probably at one time or another received messages from some of the concerns exploiting it, although of late the corpse has not made many manifestations in the United States, and Bradstreet and Dun do not seem to have found them possessed of sufficiently worldly goods to entitle them to a place in their handbooks. The November issue of "Heating and Ventilating" has the following which shows that the demise of the "Doherty Process" is not yet complete:

The Doherty Iron Castings Process, Ltd., of 16 St. Helen's Place, London, E. C., control patents on an invention which is said to give splendid results. It can readily be applied to any existing cupola of ordinary form, and the cost of adapting a cupola to work the process is very small, as no structural alterations are necessarily involved. The fittings required are merely a few lengths of steam pipe, with the necessary valves.

The process consists in admitting dry steam into the cupola at a certain period of the blow, and in certain definite quantities, in conjunction with the air blast. The steam, which, owing to the action of the blast, is in a finely divided state upon entering the cupola, is decomposed by the red-hot fuel on which it impinges into its constituent gases, oxygen and hydrogen. The result is a material increase in the temperature of the furnace, and a considerable addition to the reducing atmosphere at the zone of fusion, while the hydrogen further tends to the purification of the metal. Any oxide of iron present in the form of rust on the pig or scrap is completely reduced to the metallic state, instead of mainly passing away into the slag, where it is lost, as is largely the case in the ordinary process of melting. In order to provide the steam required, a pipe from the neighboring boiler or steam main is led up to the cupola, where it is joined on a 1-inch pipe running round the cupola, and provided with a blow-off cock. From the top side of this pipe branches of ¼-inch pipe, each fitted with a regulating valve, are taken off opposite each tuyere. Each branch is brought through the casing of the cupola, or through the wind belt, and is carried along the tuyere to within three inches of its opening. The main advantages, attendant on the use of the Doherty process for making iron castings are: (1) An appreciable saving in the cost of production. (2) A great improvement in the resulting product.

It is the same old story. All that one has got to do is to hire a plumber and purchase a few valves, and lo! the rust goes back into iron, the temperature is increased, and—if these claims are not enough more will be furnished. We might also add, for the benefit of those who are about to install the "Process" that we know of several places where a certain number of steam pipes and sundry valves accompanying same, having been used but slightly to demonstrate the "Process," are for sale at less than cost.

In Indianapolis.

Foundrymen are happy. The output for 1899 will show an increase of 30 per cent over 1898, while that of 1900, it is agreed, will be at least 25 per cent in excess of 1899. They have shared in the general revival of the iron industry, and every foundry in the city, with possibly two of the smaller ones excepted, is running with a full force. The output for 1899, as estimated by one of the most prominent foundrymen of the city, will be:

	Tons.
Small castings	10,000
Structural iron	9,000
Boilers, engines, etc.	6,000
Total	25,000

Generally speaking, Indianapolis foundrymen suffered but little from lack of raw material. While other cities were unable to get enough pig iron to meet the demand for moldings, the Indianapolis foundrymen met every order, although an extension of time was asked in many cases. A foundry owner said:

"The year has been a good one. The increase of the output can be safely estimated

at 30 per cent for 1899, and I would not be surprised to see another 30 per cent increase in 1900. Everything now points that way."—Indianapolis News.

The Supply of Mechanics.

In a recent installment of his series of articles on "Machine Shop Management in Europe and America," published in the Engineering Magazine, Mr. H. F. L. Orcott asks if the advantages, which he owns American shops now enjoy, are likely to be permanent, and he answers his own question in the negative. His reason for thus answering the question lies in the increased specialization of American shops, with the tendency which accompanies this specialization to train up boys to be mere machine tenders or operatives, instead of machanics in the proper sense of that term. In other words, Mr. Orcott believes that the very system which has given us our present position will in the end, by a process of reaction, destroy the very thing which it has created. He considers that the present American system of manufacture is the outgrowth of the conditions which preceded it—social conditions which developed independence of thought and enterprise in action, technical conditions which trained up a body of superior mechanics, and economic conditions which gave to this combination of enterprise and skill full play in business development; the result being what we see about us. There is no reader of the American Machinist who cannot count up a goodly number of men who now occupy the front rank in a business sense and who began life in the shop earning their daily bread. It is no uncommon thing to hear men who occupy positions which any one might envy speak of the time when and place where they "served their time." It is such men as these who have laid the foundations and built the superstructure of American manufactures, and they form one of the glories of America. Mr. Orcott evidently does not consider that the conditions which have produced this race of men now exist. Nor, going down the scale, does he consider that under present conditions are successors being trained to the lieutenants and privates without whose aid the efforts of the leaders would have been comparatively fruitless. In other words, he does not believe that the present condition of things is self-perpetuating. We are, so to speak, in his opinion, in the condition of a man who is living on his capital which was accumulated by the generations before him.

There is already a marked deficiency in the supply of foremanship talent. We frequently hear of openings of this kind which fairly gape to find an occupant. As industries develop and become more highly organized, a higher grade of talent in these positions becomes necessary for them; but, on the other hand, this very process of development on more highly organized lines tends to restrict the growth of the very qualities for which it sets an increasing demand.

The world is full of failures of one generation to anticipate or to attempt to solve the problems of the next. One may be convinced of the truth of these opinions and at the same time be optimistic as to the ultimate outcome. The great forces of industrial and social progress are almost as much beyond the control of man as the forces of physical nature, and for ourselves, even granting the situation to be as described, we do not fear the outcome or believe it will be what strict logic may indicate. There is such a thing as carrying logic too far. We all know men who are so minutely logical as to become in the end illogical. Nothing, in fact, is so unsafe as the application of the strict rules of logic to diverse and uncertain premises, whose relative importance and bearing upon one another cannot be known.

How the situation will or should be met we do not profess to know. Professor Sweet obviously believes the correct solution to lie in the trade school. We have no shadow of doubt that a trade school conducted on the lines laid down by him—such a school, in fact, as he might conduct—would successfully train competent mechanics. Nay, more; we believe it would train better mechanics than even the old system, except in exceptional cases, like that of the professor himself; for few apprentices, even in the palmy days of apprenticeship, had as good and capable a "boss" as he. We very much doubt, however, the advisability of the establishment of such schools by State aid. This, not because such use of State funds is improper, for we regard it as eminently proper; but because State schools of this kind would be part of the

educational system of the State, and as such would be controlled by those who have been bred in the present scholastic atmosphere. The inevitable result would be the assimilation of the work of the trade schools with that of the present educational system. The very opposite of this is necessary. The old grooves must be left behind and new ground must be broken if the highest success is attained. We could point out at least one great educational experiment which was a flat failure largely because the new idea was made the tail to an old kite.

This whole subject of industrial education is in its infancy, at any rate in this country. By common repute Germany leads in educational development on these lines. We have too little knowledge of the German schools of technology to speak of them with much confidence, and it may or may not be true that they might be transplanted to this country and be found in harmony with the new environment. We in this country have been reared to almost worship the little red school-house as the foundation of our institutions, but it should be plain to all that new conditions demand new treatment and that new wine should be put into new bottles. Despite the orthodox belief to the contrary, the wisdom of the world is not all to be found in its books, and the glorification of education, as that word is commonly understood, may easily be carried altogether too far.—American Machinist.

Massachusett's Lost Industry.

(From the Boston Globe.)

It was the iron in the natures of the Puritans which impelled them to abandon their native land and come to these shores, yet it was soon apparent that they had an eye to the iron which they had reason to believe was imbedded beneath the surface of Massachusetts bay. At the time of the English colonization in America the demand for iron was greatly on the increse, the production of British furnaces had declined with the decay of the forests, and it was not strange that these adventurers should early begin to make explorations for the metals which they had reason to believe were to be found on this side the Atlantic.

When compelled to abandon the idea of finding stores of gold and silver on the New England shore they expected much from mining for iron ore. Bog iron ore, found in ponds, bogs and in strips of meadow land, called sledger, soon proved to be a constant source of income and continued so in the New England colonies for two centuries, or until better communication brought cheaper supplies from other mining districts.

Commendable ambition has led to friendly disputes as to where the first iron was obtained in Massachusetts, and different sections yet claim the honor of the first furnace in this commonwealth, but it is evident that the existence of iron ore about Lynn was known before the first settlement there of white men.

The presence of the iron ore and the need of iron tools combined in the year 1642 to send one of the enterprising settlers of Lynn to London with specimens of the ore in the endeavor to induce English capitalists to make a venture in New England.

Capt. Robert Bridges was the man who undertook the mission to his native land, and succeeded in arousing sufficient interest to cause the formation of an association called the company of undertakers for the iron works.

The stockholders in this first New England mining company were Lionel Copley, Esq., York county, England; Nicholas Bond, Esq., of Westminster; Thomas Pary, Esq., Westminster; John Beex, London merchant; William Beauchamp, London merchant; Thomas Foley, London gentleman; William Greenhill Stepney, Middlesex county; Thomas Weld, minister, Gateshead, Durham county; John Pococke, merchant tailor, London; William Becke, merchant tailor, London; William Hicock, London citizen.

These men, enthused by Bridges, advanced £1,000 in coin for commencing work at Lynn. John Winthrop, Jr., son of Gov. John, was also in the enterprise; and Endicott of Salem had an itching palm, for in December, 1642, he wrote to the governor of Boston: "I want much to hear from your son's iron and steel." The village which grew up with the Lynn iron works was called Hammersmith, from workmen from that place in England, who were under leadership of Capt. Bridges.

Preparations were made for the manufacture of iron on a large scale, intending not only the smelting, but forging and refining the metal.

The general court was applied to for encouragement, but while approving of the plan the public purse was not equal to taking stock in the enterprise; private persons, however, came forward, and the general court granted them, March 7, 1643-4, the exclusive right of making iron for 21 years, provided they made after two years sufficient iron for the country's use.

They were granted the use of any six places, not already granted, on condition that they set up within 10 years a furnace and forge in each place, "and not a blooming only." These men, like other experimenters in the colony, were exempt from all public charges and taxation upon their stock, and themselves and workmen from military duty.

While the Lynn enterprise was under way there was another movement in the iron work at Braintree. Winthrop and his coworkers had a grant made in town meeting of 3,000 acres of the common land at Braintree "for the encouragement of an iron work to be set up about Monotoct river." The movements in the two places were similar, and there is still doubt as to which really got to work first. The works at Lynn were on the west bank of the Saugus river, on land purchased of Thomas Hudson, where there are still evidences of this most important undertaking of early colonial times.

The government of the colony of Massachusetts was identified with the iron business from its inception. In 1644 the court granted the undertakers, as they were called, three years for perfecting the work and furnishing the country with all sorts of bar iron, provided the people might become proprietors by paying within 12 months £100 each, and an allowance for the adventurers of the £1,000 they had invested at the outset, and they were to prosecute the work "to good perfection, as well the firing and forge as the furnace, which is already set up, that so the country may be furnished with all sorts of bar iron for their use at £20 per ton."

All conditions being complied with, the charter was delivered in 1644 under the public seal of the colony. They were allowed to export any surplus to any part of the world except to enemies.

In 1648, Gov. Winthrop wrote from Boston: "The iron work goeth on with more hope. It yields now about seven tons per week."

The report of Massachusetts iron set the people at home in England agog, and others made haste to these shores. Winthrop at the time wrote: "There is a grave man of good fashion come now over to see how things stand here. He is one who has been exercised in iron works."

The iron bars thus far produced were of but little utility, and the scarcity of implements for domestic use prompted the men at Lynn to try to mold the iron into implements for service.

Joseph Jenks, a native of Hammersmith, Eng., made the first molds with his hands, and was the founder of the first castings. The first article said to have been cast was a small iron pot that would hold about a quart, but it was soon followed by others, and to this man, Joseph Jenks, belongs the honor of being the Tubal Cain of the western continent.

His service was recognized by the general court, which on May 6, 1646, granted him a patent for 14 years "for the making of engines for mills to go by water," for the more speedy dispatch of work than formerly, and for the making of scythes and other edge tools, with a new invented saw mill, that things may be afforded cheaper than formerly, etc., yet so as power is still left to restrain the exportations of such manufacturers, and to moderate the prices thereof, if occasion so requires."

The making of iron pots was of great service to the settlers when such implements were so scarce that two or more families owned one between them. In the last will of one of the pioneers of Massachusetts is "to my son John the undivided half of the great iron pot."

But to the husbandman the scythe, with which to cut the grass, was a greater boon. Those brought from England were clumsy and difficult to keep "on edge," and when Joseph Jenks came forward with his blade made of iron from the bogs of the colony there was great rejoicing.

It was in May, 1655, that he was accorded a patent for an improvement in scythes "for the more speedy cutting of grass for seven years." His patent consisted in giving greater length and thinness to the blade, and in welding a bar of iron upon the back to add to its strength, as is seen in our modern scythe.

In 1652, Massachusetts undertook to estab-

lish silver coinage. Before the coin could be made there must be dies of iron cast, and the officials turned to this modern Tubal Cain for the needful tools with which to make the coin.

Mr. Jenks made the dies at the Lynn iron works with which were cut the first silver coin of New England manufacture.

The issue consisted of shillings, sixpences and threepences, to which was added in 1662, an issue of twopence. Of the shillings, there were at least 16 different dies, and several of each of the others, all bearing the same date, and stamped with the name of the colony, and a pine tree in the center, "as an apt symbol of its progressive vigor."

While John Hull is honored in New England as the first mint master, Joseph Jenks must be accorded the honor of making Hull's productions possible. One of these coins was turned with the plowshare at Concord, Mass., only a few months ago, and as an evidence of Jenks' and Hull's handiwork at Boston, over two centuries ago.

This was a time when the wooden dwellings of Boston had become so numerous that a fire made great havoc with the town, and it was decided that some instrument for the better control of the flames should be provided, and Mr. Jenks, in 1654, made a contract with the selectmen of Boston "for an Ingine to carry water in case of fire."

This was the first attempt to make or use a fire engine in America. This machine, made from Massachusetts iron, was regarded as a marvel of the age. Very few had been built in Europe at that time, and Paris did not have one until 50 years later.

As the population increased in the colonies and pushed out to land more remote from the shore, there were new discoveries of the bog ore, and the furnace and forge were sending up their smoke from various localities.

The ponds and bogs from which this ore was obtained were quite numerous on the seaboard of New England—particularly in the county of Plymouth. There were others at Middleboro, Attleboro, Carver, Scituate, Halifax and towns in that locality. This crude iron was easily fused, and when mixed with silicious ores produced a good metal for castings. Shells from the seashore furnished the flux.

Bristol county abounded in the deposits of the oxide iron, and the next attempt after those of Lynn and Braintree to manufacture iron in the colony was at Raynham in 1632.

In Norton iron works were set up a few years later. Rowley had her works in 1674. In Topsfield good iron was made in 1680. At Boxford the manufacture was commenced at about the same time. In 1702 the first furnace was erected in Plymouth county, which has ever since been a principal seat of the iron business of Massachusetts.

In 1710 Joseph Mallinson represented to the general court that he had conferred a great public benefit by making hollow ware, the first castings in sand molds, whereby the province saved annually at least £20,000 in importations. He was granted 200 acres of land because of this money saving invention. He also proposed to cast from the iron of Duxbore "some great shot of several weights" for his majesty's castle William in the harbor. In 1710 the Drinkwater iron works were set up at Abington, where cannon and shot were cast during the revolution. Here anchors, cables and bar iron were made. The anchors of "Old Ironsides" were forged at that place.

A little pig iron was exported to England, beginning with 600 pounds in 1734 and increasing to 94 tons in 1740 and ending with two tons in 1745. In the year 1750 the Bridgewater iron works were in full progress.

Hugh Orr, a Scotchman, now came into notice and did great service in the colonies by the manufacture of edge tools.

But he served the colonies later in the war by working Massachusetts ore into cannon, at the foundry at Bridgewater, where the first guns were cast solid and the calibre afterward made with a boring bar iron. The muskets made by Orr are thought to have been the first ever made in the country. It was his son who set up the plate shovel manufacture.

The reports of the growth of manufacturing aroused the home government again, and in 1750 there was a demand for an account of all such establishments and all manufacturers of iron save of the rough material were prohibited. This was declared by Massachusetts to be an infringement of her natural rights which they would not endure, but no more manufactories of the prohibited

class were set up in New England until after the provinces became free states.

After the revolution the occupation of digging and manufacturing the bog ore was revived, and flourished until the metal could be more easily obtained at a distance, when the first part of the industry gave way to the mining in the middle states, but the manufacturing has continued and forms one of our greatest industries. Some of the centers of the industry where the largest foundries are at work had their origin in the days of treating the Massachusetts bog ore, notably that at North Chelmsford, which for many years was supplied with bog ore, gathered in Groton and other inland towns and brought over the country roads in ox teams.

The writer has talked with men who recall the time when farmers made an honest dollar by turning aside from their land and teaming the ore from the bogs to the Chelmsford foundry.

So thoroughly interwoven is the iron industry with others in this commonwealth that it is difficult to separate their monetary interests, but in this state, where the industry began two and a half centuries ago, there are thousands of men employed in the iron works and millions of capital are invested in this one of the oldest industries of New England.

Four Steel Making Processes.

In a paper dealing with the manufacture of steel in the Southern states, James Bowron, vice-president of the Tennessee Coal & Iron Company, says:

There are four different methods of making steel on a large scale, for we may disregard for the moment the old cementation process, where bars of refined iron are sandwiched with layers of carbon and heated together until the carbon is absorbed by the iron. We have, however, a return to first principles in the Harveyizing process of face-hardening armor plates used on our vessels to-day, the steel having been first forged in a technically "soft" condition, and afterward hardened by annealing with carbon in contact with the face, thus giving a tough back to resist cracks and a hard face to break up the shot in its impact.

The four main processes are the acid and basic Bessemer, and the acid and basic open hearth. Both depend upon purifying the iron by oxygen. The same agent is necessary that must be breathed twenty times a minute to remove the carbon from our blood, which would otherwise poison us in a few hours, to oxidize and render innocuous the organic matter in the streams resulting from sewerage pollution, or to oxidize and burn up the metalloids in conjunction with the iron which render it unfit for steel. The four processes, which are really two subdivided into four, differ in the method of introducing this oxygen.

The most simple rough-and-ready method of purifying large masses of molten iron is the Bessemer process, which consists of blowing air by powerful blowing engines through a bath of molten iron, the oxygen in its passage through the metal uniting with and burning up the carbon, silicon and manganese. Where there is much phosphorus in the iron, it is necessary to make provision of free lime in the bath, so that as the oxygen acts as a divorce court in separating the phosphorus from the iron, it may, as it rises to the top as slag, because of the lighter specific gravity of the oxide, unite with the lime instead of remaining loose and in danger of going back again to the iron. As the presence of lime for this purpose would be inconsistent with a siliceous lining in the furnace and would be destructive to it, it is necessary in such cases to line the Bessemer converter with calcareous material, and it is then called basic Bessemer, and the iron, high in phosphorus, which is treated in it is kept extremely low in silicon as the presence of silicon in the pig would be destructive to the calcareous or basic lining of the furnace. We therefore see the irons high in silicon and low in phosphorus treated in the siliceous or acid converter, and those high in phosphorus and low in silicon treated in the basic converter; but the general principle of blowing the air through to burn up the metalloids remains the same.

The entire Bessemer process does not involve more than twenty-five minutes, and is governed by the eye of the man in charge, who stops it when he judges by the color of the smoke that the process is sufficiently perfect. If he permits it to continue a minute too long, the air, having burned out the impurities, commence to burn the iron itself, which causes waste and financial loss. If he stops a minute too soon, there is too large a

proportion of silicon or of phosphorus, as the case may be, left in the metal. Therefore, the Bessemer process, while of enormous value to mankind, is yet, compared with an open hearth process, what may be called "rough and ready."

The open-hearth process, which is similarly divided into acid and basic, on the same principles as above, which need not be repeated, does not involve the blowing of air through the molten iron, but the introduction of oxygen in solid form as oxide of iron, namely, a rich iron ore, ground and shoveled in in sufficient quantities from time to time. In the Bessemer process the combustion of the metalloids by the air passing through furnishes the necessary heat to keep the metal liquid, and great heat is necessary for this purpose, as any one will find who tries to melt a bar of iron and then pour it out. In the open-hearth process the necessary heat is supplied by melting the iron in reverberatory furnaces and passing a gas over the surface of the bath.

Quincy as a Stove Manufacturing Center.

Back in 1821, a dozen years before the first pioneer saw a desirable homestead along the muddy sloughs of the Chicago river, the Illinois legislature laid out the town site of Quincy, which city started its career as a cluster of three log cabins. Nov. 9, 1825, Quincy was platted and the broad streets that give her so handsome an appearance today were laid out. Dec. 13, of that year, saw the first purchases of Quincy town lots made. Her growth since then has been steady and healthful, with no wild cat booms and disastrous reactions. In 1835 we find the Gem City a flourishing municipality of 700 people, boasting a steam flour mill and other improvements, and in place of the pioneer Quincyites journeying 40 miles to find a blacksmith shop, already trade within a greater radius is drawn to the pretty municipality on the Mississippi bluffs.

The great coal fields at Quincy's door, the low cost at which pig iron can be delivered to her foundries, her great railroad and river shipping facilities marked her out as a great stove center, and as fas back as thirty years we find one of her historians proudly boasting that "In the manufacture of stoves and hollowware Quincy ranks second to no city west of Pittsburg for the amount of work annually turned out." In 1869 we find Quincy's stove foundries to consist of Comstock, Castle & Co., Bonnet & Duffy, the Excelsior Works and Thomas White. Those of this quartette of foundries still in operation in Quincy have vastly increased their output and the radius of distribution for same, and a number of new foundries of large capacity, controlled by energetic and skillful stove men, have made that city their home, thus greatly adding to Quincy's early prestige in the stove world.

One of the potent reasons why the city of Quincy has become so great as a stove market lies in her superior shipping facilities. The last three decades, while vastly increasing the shipping advantages of this city, enabling it to give through bills of lading to any point in the country, have witnessed a change in railroad nomenclature owing to the consolidation of various railroad lines into trunk systems that makes the great superiority of the Gem City as a railroad center less potent as regards railroad names, while in reality giving it greater facilities owing to more extended railroad connections.

Going back to the centennial year, we find that Quincy could boast a place in the title of five railroads, viz., the famous Chicago, Burlington & Quincy, the Quincy & Carthage, the Quincy, Alton & St. Louis, the Quincy & Fort Scott, and the Quincy, Missouri & Pacific. Besides these, it was a terminus of the Toledo, Wabash & Western, Lafayette, Bloomington & Mississippi, Hannibal & St. Joseph and Mississippi Valley & Western railroads. Since that time, by railroad extensions, it has been brought in even closer relations with every portion of the country.

Over 1,000 different styles and kinds of stoves are made in this city and the combined annual capacity of the Quincy plants is 150,000 cooking and heating stoves. The stove foundries at Quincy include such well-known firms as the Channon-Emery Stove Co., Comstock-Castle Stove Co., Excelsior Stove & Mfg. Co., Gem City Stove Mfg. Co., Quincy Stove Mfg. Co., Quincy Foundry & Novelty Co. and Thomas White Stove Co.—American Artisan.

Ramming.

"Pounding sand" is a contemptuous phrase used by the machinist, patternmaker or some other man connected with the factory whose

knowledge of foundry practice is very limited. The molder himself has finally come to use it, in much the same spirit as that in which the American adopted the word "Yankee Doodle." He who is able to ram molds containing patterns of widely different shape, size and proportions is an artist of a very high order, and few attain to perfection therein. Ramming is one of those mechanical processes that to the uninitiated onlooker appear to be the very simplest of operations. But, in reality, to do good ramming is a far more difficult feat than to handle a riddle gracefully. And if a machinist or a patternmaker wish to prove to himself and to every spectator just how much he lacks of being able to execute properly the operation for which he evinces so much contempt, let him go into the foundry and attempt to shake a riddle half filled with sand, says E. H. Putnam in the Tradesman. The result will be, of course, that the riddle will shake the man, and not the man the riddle. This is suggested merely as a cheap, simple and speedy way to take the conceit out of a fellow who has made the mistake of imagining that his own trade is the only one that demands practice in order to perfection. If our friend were to attempt the molding of the bed, or even of the cone pulley that constitutes a part of his lathe, he would demonstrate far more effectively his mistaken judgment concerning the art of molding, but we should perhaps have to wait a little longer before the time to laugh would arrive; though it is not at all certain that he would not make a pretty break at the outset by placing the drag wrong side up. So difficult is it to acquire in perfection the art of ramming that even the best of workmen keep to some one class of work so far as possible.

A simple snap mold may be perfectly rammed by three or four sturdy blows with the back of the shovel, while there are on the other hand many patterns made in small snap flasks that require the most careful ramming and unremitting attention in order to success. I have known a case where the shape of the peen of an ordinary wooden bench rammer made impossible the proper ramming of a very simple snap mold. There were little round projections about ⅜-inch diameter and of equal height, running straight up from the face of the pattern, and the flaring peen would, when struck down at the edge of the flask, push the compacted sand from the opposite side of the tit, or projection, so as make the resulting casting oblong instead of round. Now, this result is exactly what you have expected, isn't it? Yes; it's very natural for you to think so, now that I have told you all about it. But, as a matter of fact, you lost a good many castings, and spent a good deal of time in hard thinking before you discovered the cause of your difficulty, and if you are not more than ordinarily careful, a year or so hence, when you get another job somewhat similar, you'll lose some more work from the same cause.

Molding heavy machine castings in green sand is generally considered to be the branch of molding requiring the highest order of skill, and some of the ablest and brainiest of the world's manufacturers followed this in their younger days, and any one of these will tell you that if they had been, in their best days, changed from their regular work to the making of a stove top, or even of an oven lining, they would not have known how to ram it. They would have produced a casting that would have taxed the ingenuity of the mounter to get it into the stove. And, conversely, if the plate molder be set at work on heavy machinery, he will have to serve his apprenticeship over before he can hope to be adept; and one of the chief reasons for this is that the ramming required by the different classes of work is so dissimilar. Many a stove-plate molder does not use the butt end of the rammer at all; depending entirely upon treading the sand with his feet.

There is no common rule for ramming; various shapes and proportions require as varied treatment. To the machinery molder it might sound all right to say that the sand should be so compacted as to prevent swelling, scabbing or blowing of the casting, and at the same time to insure against a drop-out. But this does not cover the case by a long way. The stove-plate molder must ram very much harder under the flat-gate than elsewhere, or the plate will be disproportioned, and warping will result. Again, a machine casting may be rammed hard enough to prevent swelling, and yet the pores of the sand may not have been closed sufficiently to produce a good, smooth surface. This

might not count everywhere, but in making gears in an up-to-date foundry it would constitute an important feature.

We have seen that a few blows with the back of the shovel will suffice to ram a simple small mold, and that much of stove-plate work may be well rammed by treading with the feet; but when we come to make a bending die for a bulldozer, weighing, say, 1,000 pounds, it is a "horse of a different color." Suppose that the face of this die reaches up in the drag 15 inches; the face is the part that must be perfect, and it happens that in a casting of this shape the face is the part that will be most apt either to swell or scab. Now, suppose this face varies in height from 15 inches at one end, down to 8 inches at the middle, and 12 inches at the opposite end; how shall we ram it in order to insure a perfect casting? for no scabs or swells will be tolerated here. Let us first ram up the drag everywhere nearly to this face line, then fill in sand, to the depth of 8 inches everywhere over the pattern. The surface of the loose sand in the flask will now describe a contour practically like that of the face line of the pattern, and if we ram everywhere with equal force, the general contour will be the same when we get through. We begin by ramming over the whole space with an even stroke, but not too heavy, for the rammer will plunge through loose sand very easily, and if we now strike hard, there is great danger that the sand next to pattern will be too closely compacted, and a scab will result. Now, ram over the whole area again, a little harder this time, and a third time harder still, then throw in more sand and ram hard till the finish, and if you have used the judgment of an ordinarily good molder the casting will be all right. I purposely omit the question of venting, as that is aside from the topic.

There are many phenomena in foundling that we do not comprehend, simply because we are in such great measure the slaves of custom. We do things simply because we see others do them. We think for ourselves, 'tis true, but we do not always think far enough. A case in point was that of a molder who was working on sugar kettles, and found great difficulty in running them. The kettles were cast bottom down. There were three down-gates, or pouring gates, at equal distances apart, and a ring gate was cut in the cope to completely encircle the rim of the kettle, and branch gates were cut between this and the edge of the rim at equal distances clear round. A gauge was used in cutting the branch gates, in order that they should be of uniform capacity. But sometimes the rim of the kettle would fail to run at some one or more points, and occasionally even a branch gate would be run short. It took a great deal of excogitation and experience to finally decide as to the cause of this. At first it was assumed, as a matter of course, that the iron in one of the three pouring ladles had been too dull. But one day a kettle was run short, when everybody knew that the iron in all the ladles was plenty hot enough. Then it was presumed that the stream from one of the ladles had not been steady and strong enough. Every molder will concede that either of these might have been a sufficient cause for the trouble. But more than once it happened that a kettle was run short when both the fluidity of the iron and the operation of pouring were all right. Now, what was the matter? Simply that there were too many branch gates. It required less than the aggregate capacity of the branch gates to easily pass the iron as it was poured in, with the result that the iron rushed rapidly through the gates nearest the pouring gate, and but very slowly through those more remote, with the fatal result as indicated above. Acting upon this theory the branch gates were reduced to just half the former number, the uniform distance between them being still maintained, and no further trouble was experienced.

Where the branch gates are too numerous and of too great capacity the iron must in casting a comparatively thin, large casting, be poured with such force as to greatly strain the casting in some places in order to insure its running in all places. But in making a sugar kettle if the gating is properly done, the casting need not weigh much more than the pattern.

Oxide of Iron in Cupola Practice.

Altogether too little attention is given as yet to a systematical weeding out of burnt material in charges destined for important castings. Attention has been called to the

action of rusty scrap in cutting down the silicon below the normal loss, and the difference between the cupola process, which should avoid oxide of iron as much as possible, and the puddling process, in which it is a necessary adjunct, is explained at length, to which a few points might be added. First of all there are two forms of oxide of iron to be dealt with—rust, and dissolved oxide if it may be designated thus. The first, if it really got into the iron, would be the ruin of many a foundry, for the piles of rusting iron and scrap seen occasionally make one judge that at least one-tenth is oxide of iron. This rust, while infusible in itself, will either unite with the sand present to form a silicide of iron, or else reduce to iron by contact with the coke, or with the silicon, manganese and carbon in the pig iron as it trickles down through the intensely hot fire. A very small portion, however, will get into the iron and weaken it. The second form, or dissolved oxide of iron, is the more dangerous form. This comes from the oxidizing action of prolonged heating. Burnt grate bars, annealing pots, etc., when melted up with good pig iron will ruin it. This dissolved oxide is not all reduced, for reduction is best effected before fusion in a shaft furnace—as in the blast furnace—and in the cupola the running iron has not time to get all the oxide into chemical union with its carbon or with that of the fuel. When this is the case—it is so theoretically, the oxide being in contact with the carbon, silicon and manganese in the burnt iron—the result would not be a rotten casting. It would then seem that it takes, first of all, time, and then intense heat to obtain the perfect reduction of burnt iron to a good article, and for this reason it is possible to make good steel out of burnt material in the open-hearth process, and it is not possible to obtain similar results in the cupola. This question of intense heat is more important than it looks. All iron when liquid contains more or less gas. This is nearly all disengaged as it sets—the quicker the setting takes place the fewer are the evidences in the shape of blow holes, etc. Now the addition of aluminum or manganese takes away these gases (hydrogen, nitrogen and carbonic oxide) in steel, and even purifies it from much dissolved oxygen. In cast iron, however, this is not as marked and solely for the reason that melted cast iron is some four or five hundred degrees colder than melted steel. The addition of ferro-manganese in car wheel mixtures, while good, is not as effective as could be wished, its benefits no doubt lying to some extent on the reaction with sulphur. On the whole here is a subject which will repay investigations more than any other line of research, for the founder of heavy castings which must have an absolutely clean surface and be very strong will find their greatest enemy in the dissolved oxide of iron either getting into their charges or formed during the melting operation.—Richard Moldenke in Iron Trade Review.

Some English Metallurgical Notes.

In the recent work of Messrs. Donath and Haissig on silicon irons, they cite the fact that a high silicon iron, when analyzed for carbon by ordinary methods, gave about 1.36 per cent less of carbon than when the drillings are oxidized combustion with lead chromate, or volatilization in chlorine. Lower results were also obtained when the metal was oxidized with chromic and sulphuric acid. This difference, Messrs. Donath and Haissig suggest, is due to some silico-carbide. Mr. B. S. Summers has endeavored to duplicate these results, working on a ferro silicon containing about 7.5 per cent of silicon. The total carbon, obtained by solution in a double chloride and the residue burned in a combustion furnace, was 2.24 per cent. In every case in which the carbon was determined either by direct combustion with lead chromate, or the residue from the chlorine treatment burned in a combustion furnace, the results agreed quite closely with those obtained by solution in a double chloride.

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In light hardware foundry work in which great strength is not a very important item, it is well to run the silicon in the iron up even as high as 3 per cent. This practice has several advantages. It tends to make the iron more fluid, so that it will take delicate molds well, and avoid difficulty or loss due to shrinkage. It is also said to enable the foundryman to carry more scrap in his mixture. This assertion, however, is open

to serious doubt, as the amount of scrap which a mixture will carry is dependent upon the carbon content of the mixture and the scrap. As the silicon approaches or exceeds 3 per cent, the casting becomes more and more brittle, and it is desirable to keep well within the limit of 3 per cent in most cases of foundry work. For most foundry purposes, on the other hand, a silicon content below 1.5 per cent is to be avoided. These rules as to silicon are only true for ordinary foundry mixtures. Special metals and mixtures containing peculiar irons are often found to contradict these statements. The figures given, however, are an excellent guide for general practice, and will be found applicable in most cases. Sulphur should never exceed 0.10 per cent in good foundry practice, and an effort should be made to keep the proportion lower.

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The specifications for special hard iron castings adopted by several well-known makers of agricultural implements are reprinted in slightly condensed form below:

Designed for air and ammonia compressors, high pressure engine cylinders, valves, etc.

Silicon must be between 1.20 and 1.60 per cent. (Below 1.20 per cent the metal will be too hard to machine; above 1.60 per cent it is liable to be porous unless much scrap be used.)

Sulphur not over 0.095 per cent. Any casting showing 0.115 per cent or more of sulphur will be the cause for rejection of the entire mix. (Above 0.115 per cent produces high shrinkage, shortness and "brittle hard" iron.)

Phosphorus below 0.70 per cent, unless specified for special thin castings. (High phosphorus give brittle castings under impact.)

Manganese not above 0.70 per cent, except in special chilled work.

Transverse breaking strain, with load applied at the center and supports 12 inches apart, on a square test bar 1 inch square and 13⅓ inches long, must stand a stress of not less than 2,400 lbs. All bars to be micrometered and figured to an exact square inch.

Deflection not less than 0.08 inches.

Shrinkage, measured on a 13⅓ inches bar cast in a yoke, giving chilled ends, must not exceed 0.161 inches after deducting one-tenth so as to compute the shrinkage in 12 inches.

Chill, measured on the end of a test bar cast in a yoke, not more than 0.25 inches, except in chilled work where certain depth is required.

Tensile strength of an extra test bar cast in sand, without the yoke, not less than 22,000 lbs.

The castings must be free from blow-holes, slag, dirt, shot, cinder, kish, and cold shuts.

A clean, close-grained and strong iron is required for this class of work.

The mixture for this iron may be made from charcoal iron, low silicon foundry, home scrap and steel scrap not to exceed 25 per cent, or wrought scrap not to exceed 10 per cent.

Enough scrap should be used so as to keep the graphite carbon down low enough to produce a close-grained iron.

Extra strength and greater chill may be obtained by adding from 1 to 10 lbs. of 80 per cent ferro-manganese to every 1,000 lbs. of the charge, but should not be added unless specified.—Iron and Coal Trades Review.

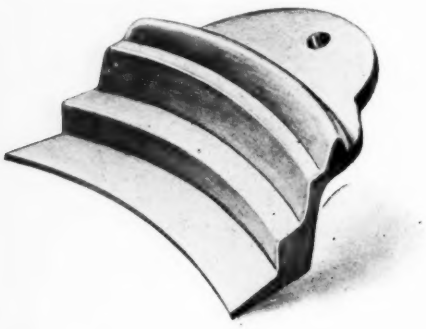
Credit to Whom Credit is Due.

An ingenious American—a man perhaps wearing overalls or a gingham apron, and having a far more intimate acquaintance with lathe tools, files and chisels than with moduli of elasticity or radii of gyration, invents an improvement pertaining more or less strictly to his work, or perhaps devises a machine which does away with hand work or quadruples its efficiency—in other words does what is constantly being done in American shops all over the land. If the machine or device itself is sold, his work becomes known more or less outside the shop in which he works; otherwise not. Afterward an academic engineer, who could not tell a good file from a poor one, applies mathematics and all formulas and moduli and other things to this device or machine and tells the world all about how it works and why it works, and lo! the result of his labors on the machine goes into the literature of the profession as an engineering work, while that of the creator of the machine is entirely obscured and lost sight of. What we want to specially call attention to, says the American Machinist, is the fact that it is the creative work

that is being done mostly in shops by men who are not generally recognized as engineers at all that is, more than any other work, spreading our name and fame abroad.

An Improved Gate.

We illustrate herewith an improved gate on which a patent has been granted Jas. O. Little, foreman of the Thos. White Stove Co., Quincy, Ill. The illustration shows the form of the gate as used in the casting of



stove lids, it being understood that with suitable changes this gate can be utilized in the casting of any article. A glance at the illustration shows that this gate is in reality a double skimming gate, the lower reservoir tending to retain any slag or impurities which may have passed through the other apertures. Mr. Little's gate is claimed to have given excellent results in practice.

Pittsburg Foundrymen's Association.

At the December meeting Mr. Charles V. Slocum made an address on the subject of brake shoes, and a general discussion of the subject followed. Mr. Slocum pointed out that brake shoes cost very much less than car wheels, and it is therefore not desirable to make them in such a way as to affect the life of the car wheel. He said that there had been a great many "patent" brake shoes put upon the market, which were sold at a higher price than the ordinary gray iron shoe, and they caught the fancy of purchasing agents because they were claimed to last longer. The usual procedure was to put a few in operation on trial, and when they proved that they would last longer a large order would be given. The difficulty in such cases is that the longer life of the shoe is at the expense of the wheel. This is particularly true of brake shoes which have been put on the market with particularly strong claims. They have a chilled face, and while they last considerably longer they wear out the wheel much quicker, make it much harder to stop the train, and are liable to cause accidents by sticking to the wheel, which also produces flat wheels, from the sliding of the wheel on the rail. These chilled brake shoes usually cost about 1½ cents a pound. They cost at the present time about 3 cents a pound. A brake shoe weighs about 25 pounds, so that the total cost now is about 75 cents apiece. The saving of a brake shoe or two is of small consequence when it is considered that the life of the wheel is shortened considerably, seeing that in ordinary times car wheels cost from $5 to $6, and at the present time from $8 to $12. After Mr. Slocum's address there was a general discussion of the subject. It was stated that under ordinary conditions the making of flat wheels was done by the mode in which the brake was applied, but the chilled surface brake shoe stuck more readily, and was more likely therefore to cause flat wheels. The principal difficulty in the manufacture of good car wheels was to avoid as much as possible casting strains. It is taken as a rule that if a car wheel lasts for a month it will wear out rather than break. The one month's service reduces the casting strains so there is little danger of breakage.

American made car wheels are acknowledged to be the best in the world. Lately considerable quantities have been exported, and the trade in this direction is growing. There is a prejudice in Europe against chilled cast iron wheels, such as are used exclusively on American roads. In France the government railroads are not allowed to use them, the law requiring wrought iron wheels, and there is a plant there which makes about 200 wrought iron car wheels a day. American wheels have been exported to France for use on roads other than government roads.

In regard to the use of charcoal iron in the manufacture of chilled rolls and car wheels, it was remarked that it had often been stated that the tonnage of chill rolls produced in the country considerably exceeds the tonnage of charcoal iron produced. This would leave nothing at all for the car wheels. It should be noted, however, that both rolls and car wheels, when worn out, weigh almost as much as before, so that the actual destruction of material is small. In some

cases some coke iron is used in the manufacture of car wheels, but some makers use charcoal iron, either new or in the form of scrap, exclusively.

The standard Pennsylvania railroad freight car wheel must weigh not less than 590 pounds, and not more than 620 pounds. They are paid for by the wheel, and not by the pound, so the aim of the manufacturer is to keep the weight down, but not so low as to run the risk of having any fall below 590 pounds. A weight of 600 pounds is usually aimed at. If the wheel weighs more than 620 pounds it is rejected altogether.

When I was A Bigger Lobster than I am Now.

Some people are born lobsters; others are self-made, while others again have the pink shell thrust upon them. Every man is more or less a crustacean at certain periods in his career. A few outgrow the habit, or live it down, and the rest use lobsterine until they die.

This lets me in on the deal, and I don't deny having been a much bigger lobster than I am now, including the little bunch of green they place at either end of the plate. That was in the days before the oil in the mayonnaise had time to soak in. Sometimes I think the epoch has been bottled up, but this is only a feeble jolly I'm handing myself. Real lobsters seldom forget what they were.

With no intent to spring the story of my life, I'll state that between the age of 8 and 12 years I made myself bow-legged carrying heavy lunches to school in a mud-bound village in Illinois. I also have hazy recollections of a Mr. McGuffey's Second Reader with the corners gnawed away. Of the benefits gained at that time few remain with me now beyond the anatomical curves. At fourteen my folks in executive session resolved that I could thereafter make good the lunches by feeding my own face, which I did by bursting joyously into the iron foundry as understudy to a fat molder at four bones a week.

For three years I threw stunts in a pile of black sand, learning the trade. Some of the cast-iron stove legs I built when a boy are still leaving footprints on humble kitchen floors—lasting tributes to my budding genius in the gentle craft of molding. Whatever bad breaks I may have since made in other lines cannot wipe out the fact that I was a fair to middling molder at the finish, and on that account I like to toss bouquets to myself from out the dusty foundry.

There's nothing on earth I respect more than a man who knows his business to the limit. It matters not what the work may be, so long as the worker is next to his technique. To tote a hod of bricks up a five-story ladder without touching either hand to the hod is high art of its kind, and for this reason the hod-carrier is worthy of admiration. At the same time he's a lobster for not seeking a softer job if he can conceive of one.

Those were happy days in the foundry, because I had not then learned to loathe the perverted genius who invented work and forgot to take out a patent on it. Being an enthusiastic kid, I carried bags of sand home and molded things, mostly lead nickels, in the cool of the evening. Ambition stirred me, too, for I hoped to some day become a foreman and sit for hours on a nail keg, thereby staggering common workmen with the belief that I knew so much about the trade it made me tired to carry it around.

That dream was only a pipe, but my name appeared in the directories of several large cities, linked with the words "Iron Molder" in smaller type and the street numbers of fierce boarding-houses, so that I am not utterly unknown to fame after all.

While the majority of molders are steady men with large families and other minor troubles, a hobo mechanic now and then fell off a passing freight train and asked for a job. This struck me as the ideal existence—traveling about the world with a Union card, unhampered by care or baggage, in search of a fresh sand heap; for like the tramp printer the wandering sand artist carries nothing but his hands and his trade. The shop supplies the rest. One white-haired ruin, who lingered for a grub stake in the factory where I served my sentence, had wrestled with a touch of the jim-jams in most of the manufacturing towns of note on the map, and had not yet wound up his itinerary. To me he was a regular Christopher Columbus of a molder, a man to emulate in all save the flowing bowl specialty.

At the expiration of the three years, geared up to 104 with the handlebars down I scorched hopefully forth with my trade and a 90 cent valise to make a few lasting

scars on some portion of the universe. They tell me it's that way with all young fellows who are full of ginger at the start. Anyhow, Omaha saw me first and it was there I glowed with the rosy blush of the lobster in a blizzardy winter season. My first play on finding a job was to pick out a preceptor—a sedate and finished mechanic of mature years, whose style a youngster might copy and thus become perfect; for I had sense enough even at that date to know that as yet I was only half baked.

Mr. Spruce, champion all-around sand pounder of the Omaha Foundry and Machine Company—the man who made the large fly wheels and dry sand cylinders, filled the bill to my notion. A tall, wobbly genius was Mr. Spruce, with a chest like the inside of an open trunk lid. He was so thin, too, that when he sat in a chair with his legs crossed the soles of both feet touched the floor. However, these points did not occur to me then. They come floating back in retrospection and make me smile, after twenty years, like nothing else I know of.

In two months I was a second edition of this Royal Arch molder in everything relating to mechanical grace, style and execution. Anything he did I did, and felt that I couldn't go wrong. Mr. Spruce saw that he had scored a touch-down back of goal with a lobster, and that knowledge pleased him, I know, for he hypnotized me with tales about an engine bedplate he once cast in Sacramento that weighed sixty-four tons. Helpers hoisted him in and out of the mold with a derrick for a couple of weeks, he said, and when the plate was cast they had to tear the shop down to get it outside. That job placed him in the front rank of the peach class, and I begged him for his photograph. What Henry Irving is to the stage butler this master molder was to me, and I fairly worshiped the sand he shoveled.

One evening, after work, Mr. Spruce, being a fatherly man with a good heart and kindly impulses, asked me to his home to supper. As we left the shop, on the outskirts of the town, an inbound freight train rumbled along. We climbed to the top and rode half a mile or so to the place where Mr. Spruce got off. Instead of climbing down the iron ladder and swinging to the ground, after the fashion of $35 per month brakemen, he moved that we spring to the roof of a lonely boxcar standing on a parallel track and descend at leisure. I said all right, and he led the way.

Anybody but a lobster in the can knows that a brisk run on leaping from a moving train is necessary to maintain a dignified equilibrium, but I was in the clutch of a master mind. Two seconds after my all-wise preceptor hit the roof of the stationary car he was due at the jumping-off place, at the other end, going full speed. He arrived on schedule time, and so did I, one lap behind. The fall on the frozen ties below telescoped Mr. Spruce's spinal column, and I broke my own nose and three of his ribs plunging down on top of him.

Thus did an iconoclastic boxcar, painted red, shatter my first and only idol. Mr. Spruce went to the hospital, and when my nose subsided so that I could see around it I pulled my freight for the warm belt in Dixie. We never met again. Since then I have traveled with more or less comfort on the inside, outside and underneath boxcars in many states and territories. This mention is made, not as a proud boast, but merely as part of a mottled career.

On all these pilgrimages and during the halts between, there shone a warning vision of that finishing spurt on the car roof in Omaha; and now, in figuring the dope, I hold that any boy with horse sense and his tires pumped up can get somewhere without the aid of a pacemaker.—Charles Dryden in San Francisco Examiner.

The Year in Iron and Steel.

It is a difficult matter to attempt to chronicle the doings which make the year 1899 pass into history as the most important one which the American iron trade has seen. There is the more reason to make the attempt, however, because the whole trade has been so busy that there is but a confused remembrance of many events which under ordinary circumstances would leave an indelible impression.

The year has been remarkable chiefly for the wonderful advance in prices and the record breaking tonnage. It has been important because it is the first year of the new iron and steel consolidations, and something has been learned of their methods and their prospects of success, though as to the latter the developments would have been more valuable in a normal year than in the one we have had.

The year 1899 opened with every prospect of its proving the best the iron trade had seen for a long time. The last month of 1898 had seen the strongest and most active market ever noted in December. Prices had advanced during the month, and were decidedly high as compared with the average for 1898. There had been an unusual buying movement during the closing months of the year, and there was no doubt whatever that the early part of 1899 would be very prosperous for the whole trade. But the prices at which the year opened, $10.35 valley, for Bessemer pig, and $16.50 for billets, for instance, were regarded as very high, and the conservative element in the trade feared that when the lower priced material which had been contracted for was consumed, there would be difficulty in continuing sales at such a level, so that there were grave doubts expressed as to the future, and every effort was made to hold prices down, it being well understood that the ultimate effects of a short boom would be very undesirable. But the efforts of manufacturers to hold prices down only resulted in their being loaded with orders, and in most cases the tonnage taken on was greater than could be filled in the time called for. Thus there was a steady advance until the latter part of the year, buyers forcing prices up on themselves, although there were not wanting predictions at any time that the high point had been reached.

The great rise in prices was due to two facts: the very large actual consumption of material and the fear of buyers which led them to buy beyond their actual requirements. The culmination of the movement was reached when such heavy premiums were required to secure prompt or early delivery, and the highest prices of the year were those which were exacted only in special cases where very quick shipment was required in a market bare of stocks. The culmination of the high prices was in the latter part of September and the early part of October, and these special prices were for quick delivery. Probably much of the strength to the market at this period was due to the necessity of getting odd lots of finished material for use before the bad weather would put a stop to many kinds of out-door work. From that time on prices began to decline by the removal of the premium required for quick delivery. The recession of prices up to the end of the year was largely of this nature, since there is little doubt that if even in September and October buyer and seller had desired to get together on business for 1900 contracts could have been entered into at substantialy lower prices than those which were being paid for the kind of business which was actually being done.

The following table shows the current market prices for moderately prompt delivery at the beginning of the year and at the end of each quarter:

	Jan. 4	Mar. 9	June 28	Sept. 27	Dec. 27
Bessemer pig, valley.....	$10 35	$14 50	$19 00	$23 25	$24 00
No. 2 foundry, Pittsburg....	10 50	15 50	17 25	21 50	23 00
Gray forge, Pittsburg....	9 75	14 50	17 00	21 00	21 00
Bessemer billets.....	16 50	25 50	33 00	39 00	35 00
Steel bars.....	1.00c	1.50	2.00	2.50	2.25
Tank plate....	1.20c	2.00	2.40	2.85	2 50
No. 28 sheets..	1.90c	2.50	2.95	3.20	2.95
100-lb. coke tins	$ 3 00	$ 3 87	$ 3 87	$ 4 65	$ 4 65

Galvanized sheets opened the year at 8c and 10 per cent off; March 29, 75 per cent; June 28, 70 and 10 per cent; September 27, 70, 10 and 2½ per cent; December 27, 75 and 10 per cent.

It would be a mistake to suppose that the average price of the tonnage which went out this year was anything like the average market figures quoted during the year. This was far from being the case. When the year opened there was a very good tonnage on books at prices lower than then quoted, although such prices were the lowest during the year. A very large rail tonnage had been booked at very low prices, and this helped to furnish a very good foundation, added to which were large purchases of billets and other forms of material. The greatest selling of the year was in the early months, when manufacturers were selling freely, with the idea of keeping prices within bounds. Their efforts were well meant, and no one could have been expected to foresee what actually happened, but events have showed that it would have been much better if they had advanced prices at once and tried to check buying. As it was, there was money enough in transactions for nearly all lines, but there were still a good many who suffered more from the advance in their raw materials than they gained from the advance in their products. There were many such cases in the foundry trade. Those who covered early, however, had a good year.—Tin and Terne:

Changes in the Craig-Reynolds Foundry Co.

The Craig-Reynolds Foundry Company, Dayton, Ohio, manufacturers of Triumph hot water and steam heaters and Triumph acetylene gas machines, have disposed of their plant and business to the Reading Stove Works, Orr-Painter & Co., Reading, Pa. This deal has been pending for a number of months, and the formal transfer of the business will be made January 1, 1900.

The Craig-Reynolds Foundry Company was organized in 1892 by Zenas A. Craig and H. N. Reynolds, who have been the active officials and managers of the business since that time. The present plant covers some five acres, and is equipped with commodious brick buildings, with modern equipments and machinery throughout, and employs upward of 300 mechanics.

The Reading Stove Works, Orr-Painter & Co., Reading, Pa., have been in active business for some forty years past, and have large foundries at Reading, Pa., with branch warehouses at New York, Boston, Philadelphia and Chicago, from which their product is distributed, while their export trade has developed to a considerable extent. For some time past they have realized the desirability of handling their western trade from a nearer point than Reading, and negotiations were commenced which resulted in satisfactory conclusions, and the purchase was agreed upon.

The Reading Stove Works, Orr-Painter & Co., in connection with the handling of the present business of this company, will build all the stoves and ranges required for their western trade at this point, and they will erect suitable buildings for that purpose, including a brick foundry building 80x210 feet in size, with a cupola capacity of 40 tons; a nickeling and polishing building 20x40 feet, a warehouse 50x200 feet, and a brick power building, with engine and boiler sufficient in size to operate the entire plant. It is expected to have these buildings completed and in operation by January 15, and this, in addition to the present capacity, will enable them to work 450 employes to good advantage and handle a very large output.

The Reading Stove Works, Orr-Painter & Co., will devote both the Reading and Dayton plants to the production of Triumph warm-air furnaces, Triumph hot water and steam boilers, both round and sectional; the Sunshine stoves and ranges, and the Torrid Sunshine warm-air furnace. All of these products are well known to the trade, and the increased facilities and advantages which this combination will produce will enable a large volume of business to be promptly and satisfactorily handled, and a large stock of furnaces, stoves and boilers will be carried at all the branch warehouses, so that the trade can depend upon prompt deliveries, and the utmost dispatch in taking care of their requirements.

Both Mr. Craig and Mr. Reynolds will remain with the Reading Stove Works, Orr-Painter & Co., as active managers of the Dayton plant, so that all old customers of the Craig-Reynolds Foundry Company will meet with the same treatment, and all business will be handled with the same care as hertofore.

Both the Reading and the Dayton plants will be kept running to their fullest capacity from the 1st of January, so that ample stock will be provided for fall requirements.

Consolidation of Sanitary Enameled Ware Manufacturers.

The consolidation of the porcelain enameling interests, which was effected recently at Pittsburg, under the name of the Standard Sanitary Enamel Mfg. Co., it is understood embraces all the plants that make enameled ware, such as bathtubs, wash stands and general laundry and bathroom equipments in the natural gas fields of the entire country. There is one large manufacturer still using the old coke system in his plant, and the promoters of the scheme thought this concern so little a factor in the business that a representative from the concern was not even invited to participate in the deliberations of the promoters. The consolidation was brought about through the efforts of Francis J. Torrance, of the Standard Mfg. Co., Pittsburg, Pa.; E. L. Dawes, of Dawes & Myler, New Brighton, Pa.; Theo. Ahrens, Jr., of the Ahrens & Ott Mfg. Company, Louisville, Ky., and a representative from the L. Wolff Mfg. Company, Chicago. The committee have been in constant session since the middle of October, visiting and appraising the various plants to be included in the consolidation, and their labors having been completed the apportionment of the stock was made and the deal consummated.

It will take effect on January 1, 1900, when the new concern will take possession of the several plants acquired. It is understood that it is not to be a speculative consolidation, but is to be maintained for the manufacture and sale of enameled goods alone. It is expected that the new concern will be able to market their wares at a considerably lower cost than has heretofore been the case. Instead of having three or four manufacturers competing in the same territory there will be one agent who will sell the wares of the various plants, and all the consumer or jobber will be able to do will be to make his selection of the goods of a similar grade and design and the order will be executed at the same price, regardless of the location of the plant from which the goods are to come. It is the intention of the promoters to retain all the stock of the new concern and none of it will be offered for sale in the open market or outside of the various manufacturers interested.

It is alleged that the advance in the price of enameled goods during the past year has not been commensurate with the increasing cost of raw material and labor and one of the first effects of the consolidation will be an advance in the prices of all goods to a much higher level than is now obtaining.

The following plants will be included in the new concern either by consolidation or purchase:

The Standard Mfg. Co., Pittsburg, Pa.

Ahrens & Ott Mfg. Company, Louisville, Ky.

Dawes & Myler, New Brighton, Pa.

McVay & Walker, Braddock, Pa.

A. Weiskettel & Son, Baltimore, Md.

R. M. Wilson Mfg. Company, Rome, N. Y.

Buick & Sherwood Mfg. Company, Detroit, Mich.

Sanitary Mfg. & Enameling Company, Muncie, Ind.

The Pennsylvania Enamel Bathtub Company, Elsworth, Pa.

Cribben & Sexton Company, Chicago.

Stuart & Peterson Company, Burlington, N. J.

Jacob Vollrath Mfg. Company, Sheboygan, Wis.

Jones Hollow Ware Company, Baltimore, Md.

L. Wolff Mfg. Company, Chicago.

Some Pointers on Brass Mixtures.

BY C. A. D.

In reply to Mr. Wagner's inquiry, would say that practically the best advice to give is: "Try, try again," taking it for granted that he uses fine Albany or Ohio sand (or any other sand equally as good). As for facing and parting, I find pure charcoal as good an article for the purpose as I have been able to obtain.

Mr. Wagner undoubtedly understands that certain kinds of brass do not run as well and sharp as others; for instance, brass containing a high percentage of zinc and a small amount of lead will not run as well as the brass without the lead; and if castings are intended for ornamental purposes, with little or no machine work on them, the brass containing a high percentage of zinc casts sharper and runs better than the brass with a lower percentage of zinc, taking care that it is not poured at too high temperature, or the metal will jump out of the molds.

Adding aluminum to brass will make it run as sharp as in baked or dry mold, but aluminum brass is not practical for all purposes, as it has a tendency to crack or shrink; but with a little practice in gating and pouring, ornamental castings can be made in it that are clear and sharp.

Deaths.

J. S. Cunningham, the pioneer foundryman of Irwin, Pa., died Dec. 18, aged 77.

Frank M. Avery, vice-president of the Chicago Brass Co., Chicago, died on Dec. 12 of acute gastritis.

James McQueeney, formerly president of the Nashua (N. H.) Co-Operative Foundry Co., died in that city recently.

James S. Weldon, for a number of years manager of the Lewiston (Pa.) Foundry and Machine shops, died recently.

James H. Dunn, for a number of years foreman of Bartlett, Hayward & Co.'s foundry at Baltimore, Md., died Dec. 18, aged 50.

Capt. Leon Haubtman died in New Orleans, La., Dec. 15, aged 55. He was a native of Alsace, and came to this country when 21 years of age. He rose from mechanic to foreman, and finally became the

head of the Edwards Machinery Works, and subsequently of the firm of Haubtman & Loeb.

Fires.

Greenslade Foundry Co., Milwaukee, Wis., Dec. 20. Small loss.

Fayetteville (Ark.) Iron Works, destroyed Dec. 17. Plant will be rebuilt.

Newport Iron and Brass Foundry Co.'s plant at Newport, Ky., burned Dec. 2.

G. Rebmann & Co., Philadelphia, Dec. 29. Damage estimated between $2,000 and $3,000.

Springfield (Ohio) Architectural Iron Works had a small blaze Dec. 20. Nominal damage from water.

Fire badly damaged the works of the Palmer & De Mooy Foundry Company at Cleveland, O. Loss estimated at about $10,000, fully covered by insurance.

The Mechanics' Foundry at Evansville, Ind., owned by Ferdinand Holtz, was severely damaged by fire Dec. 15. Estimated loss on buildings and patterns, $9,000.

The large factory of the Chicago Hardware Foundry at North Chicago, was partially destroyed by fire a short time ago. The loss is estimated at $5,000. The burned portions will be rebuilt, and an addition, a brick office structure and a japanning room will be erected.

Among the Foundries.

M. Hanna is erecting a foundry at Earlington, Ky.

The Centerville (Iowa) Foundry has been purchased by Joseph Goss.

The Fox Copper & Bronze Mfg. Co. has been launched at Pittsburg, Pa.

Smith, Wallace & Bontas are building a brass foundry at Stoneham, Mass.

The Pittsburg Stove & Range Co. is extending its plant at Sharpsburg, Pa.

The Houser Bros. Brass Mfg. Co. has been incorporated at Louisville, Ky.

S. Morgan Smith, of York, Pa., manufacturing turbines, will erect a foundry.

The Monessen (Pa.) Foundry is being enlarged and will have double its present capacity.

The Capital City Foundry was recently incorporated to do business at Indianapolis, Indiana.

The Oberlin, Kan., Foundry & Machine Shops will soon be put in operation by J. M. Sears.

T. A. Griffin has purchased the Kansas City Car & Foundry Co.'s plant at Kansas City, Mo.

Morren & Calderwood, of Danbury, Conn., have sold their plant to the Turner Machine Co. of that city.

The Joplin (Mo.) Foundry Co. has been incorporated by J. H. McKenna and others with a capital of $30,000.

The J. H. Wagner Co. has been incorporated at Vernon, Ind., to conduct a foundry and machine shop.

The Unique Furnace Co. of Columbus, Ohio, has changed its name to the Rayburn Furnace & Foundry Co.

The Chattanooga Pipe & Foundry Co. has begun work on a plant for the manufacture of soil pipe, at Chattanooga, Tenn.

The Oxford Brass Foundry Company of New Haven, Conn., has been organized with a capital of $10,000, $3,000 paid in.

The Schuylkill Iron & Steel Company are erecting a foundry at Thirtieth street and Gray's Ferry avenue, Philadelphia.

The Brainerd Milling Machine Co., of Hyde Park, Mass., will hereafter be known as the Becker-Brainerd Milling Machine Co.

The Columbian Iron Works & Dry Dock Co., of Baltimore, has assigned. H. A. Parr has been appointed receiver.

The capital stock of the Belle City Malleable Iron Company, Racine, Wis., has been increased from $75,000 to $125,000.

Beall Bros. have purchased the Piasa Foundry at Alton Ill., owned by Richard Garstang, the consideration being $13,500.

Henry H. Walker has begun to build a two-story foundry, 60x100 feet, at 904-910 South Rockwell street, Chicago. It is to cost $9,000.

The John A. Hayes Foundry Co., of Lynn, Mass., has been incorporated under the laws of Maine. This concern succeeds the Union Iron Works of Lynn, Mass.

Reports state that the Snead & Co. Iron Works of Louisville, Ky., after more than half a century's existence in that city, will be moved to Jersey City to obtain better facilities.

Chester E. Watkins and F. F. Weihl have purchased the plant of the Chickamauga Foundry & Machine Company, near Chatta-

nooga, Tenn., for $10,000. They will double the size of the plant and operate it.

A. E. Stevens will erect a foundry at Leeds, Iowa, a suburb of Sioux City. The foundry will turn out stoves, lawn furniture, iron fences and brass work, and will give employment to about 25 men the yiar round.

The Athens (Ga.) Foundry & Machine Shops, which have been idle for two years, were recently purchased by Capt. James White. For many years this was the most valuable property in Northeast Georgia, and the probability is that the foundry will soon be again in operation.

The Columbia Iron & Steel Foundry Company, Pittsburg, will shortly be chartered by C. C. Lee, C. W. Robb, George P. Loomis, W. R. Brown and S. McCrum. The company has secured a tract of land between 34th and 35th streets, Pittsburg, and will erect a plant for the manufacture of iron and steel castings.

The Duquesne Steel Foundry Co. has been incorporated by Thomas Rodd, chief engineer of the Pennsylvania Company; E. Kneeland, of the Frank-Kneeland Machine Company; W. A. Herron and A. W. Herron, of William A. Herron & Sons, and T. H. Bakewell. A site has been secured at Coraopolis, a suburb of Pittsburg.

The Union Foundry Works, Seventy-sixth street and Greenwood avenue, Chicago, are making extensive alterations and additions to their large works. They are installing a new 84-inch Colliau cupola, which will have a capacity of forty tons a day. They are building a charging room which will be entirely fire-proof, and are adding new machinery, which will make the plant entirely modern. They report the passing year one

The Wolff & Zwicker Company, Portland, Ore., are making active preparations for the manufacture on a large scale of mining machinery of all kinds. The firm will make stamp mills, cars, concentrators and all kinds of chemical apparatus. Should the plan prove to be successful, the Wolff & Zwicker Company will build additions to their plant. In fact, this is being done to a certain extent, the old machinery being replaced by new and improved implements.

Rumors are circulating to the effect that a new consolidation, to be known as the International Car Wheel Co., will shortly be effected by the absorption of the New York Car Wheels Works, the Philadelphia Car Wheel Co., the Pittsburg Car Wheel Co., the Boston Car Wheel Co., including the Swett Car Wheel and Foundry Co., of Chelsea, Mass., Ramapo Wheel & Foundry Co., John McDougall & Co., Montreal, Montreal Car Wheel Co., Hamilton (Ont.) Wheel & Foundry Co. and the St. Thomas (Ont.) Car Wheel Co. The proposed capital stock is $15,000,000.

The Mahoning Foundry & Machine Company, Youngstown, Ohio, has been incorporated with a capital stock of $25,000, by Geo. M. McKelvey, L. E. Cochran, Frank D. Runser and Mason Evans. The new concern will engage in the manufacture of iron and steel castings in various forms, and will take over the present business interests of the Mahoning Foundry & Machine Company, whose plant is located at 23-25 North Watt street, in Youngstown. The following officers have been elected: Frank D. Runser, president; Mason Evans, vice-president, and Fred G. Evans, secretary and treasurer.

The consolidation of the Soo Iron Works, of Sioux City, Ia., and the Norfolk (Neb.) Foundry & Manufacturing Co. was effected recently. The consolidated company will be known as the Sioux City Foundry & Manufacturing Co. and will continue the operation of the Norfolk plant. E. A. Bullock will be president of the new company and Milton Perry Smith, of Sioux City, secretary-treasurer. It is expected to enlarge the plant of the Soo Iron Works and to make a specialty of manufacturing the Norfolk "warm air" furnace. Work will be commenced on the enlargement of the Sioux City plant just as soon as some large contracts on hand are finished.

The Stockham Manufacturing Company, Forty-sixth street and Grand avenue, Chicago, have about completed the erection of the new additions to their plant. The new foundry is 100x300 feet and the new finishing room is 160x180 feet. The plant has been entirely remodeled and equipped with the most modern machinery. The capacity of this has been increased to 30 tons a day. All machinery is operated by electric power. The works have ample railway accommodations. The Belt Line, Northwestern & Chicago, Milwaukee & St. Paul bound them

on three sides. Malleable iron castings will be one of the features of their output. The capital stock has been increased from $100,000 to $200,000. W. J. Smith has been elected treasurer of the new company. The plant will be ready about Jan. 15.

Allen R. Rea, for 24 years connected with the W. F. & John Barnes Company, of Rockford, Ill., has resigned to accept the post of secretary of the B. F. Barnes Company, a new concern whose officers are: B. F. Barnes, president; William Nelson, vice-president; Allen R. Rea, secretary, and Samuel H. Reck, treasurer. The B. F. Barnes Company are making rapid headway with their buildings. The stone work is done and the bricklayers are now hustling. The company will have complete foundry and machine shop equipment. Their tool capacity on the start will be between 35 and 40 men. The company will manufacture a full line of drills and lathes. It is expected that the start will be made on Feb. 1. The plant of the company will have an ideal location. It is on the river bank just south of the paper mill property. The Illinois Central are putting in a switch which will be 1,800 feet long. The Edison Company will furnish the power, a five-year contract having been closed. The first installation will be four motors. The capital stock is $50,000.

Trade Publications.

A second edition of the lecture by Walter R. Snow on "The Influence of Mechanical Draft Upon the Ultimate Efficiency of Steam Boilers," has just been issued by the B. F. Sturtevant Co. of Boston, Mass., by whom copies will be sent upon application.

The Ottumwa Iron Works, Ottumwa, Iowa, have issued their 1900 Annual Machinery Catalogue, illustrating and describing very completely their line of hoisting, hauling and prospecting engines and mining machinery. This catalogue is unique in design, contains 48 pages, is handsomely illustrated and contains a special article in the haulage of coal by wire rope. Copies may be had upon application.

The Garden City Sand Co., Chicago, have issued a catalogue of Fire Brick, Fire Clay, Molding Sand and other materials, which, besides describing this firm's product also contains a lot of useful information. Copies may be had upon request.

The Buffalo Forge Co., Buffalo, N. Y., are mailing a brochure to the trade describing the Buffalo Down Draft Forges, including a number of new types brought out to meet special requirements.

The Standard Pneumatic Tool Co. of Chicago and New York, are mailing their catalogue "D" to those interested in pneumatic appliances.

A German Brass Furnace.

In our December issue we published an illustrated description of a German brass furnace contributed by Robert Wagner. Since then our attention has been called to the fact that this form of oscillating furnace is known as the Piat furnace, a United States patent having been granted thereon in 1892. This is owned exclusively by the Ajax Metal Company, of Philadelphia, who advise us that they have, since that time, taken out additional patents on improvements made by them. Besides the United States we understand this company also controls the sale of this furnace for Canada.

The W. A. Jones Foundry & Machine Co., 55 to 59 S. Jefferson St., Chicago, manufacturers of all classes of power transmission appliances, have just bought the plant of the old Chicago Steel Co., located at the intersection of North ave. and The Chicago & Northwestern R. R. Co.'s tracks. This tract comprises about one and one-half acres of land, having a railroad frontage of 582 feet and a frontage of 240 feet on North ave. It contains several substantial brick buildings, which will be remodeled to suit the company's requirements for their particular line. Mr. Jones informs us that for the third time in nine years since they started, they have outgrown their quarters, and that they now intend to operate their new acquisition in connection with their present location, where they now have a frontage of 72x150 feet in depth, occupying two floors. As soon as they can get themselves in shape, they intend to add to their present business, the manufacture of machine tools for the production of pulleys and rope transmission sheaves at a minimum cost, this machinery applying to both foundry and machine shop. They are at present building two pulley lathes with a capacity of 54 inches, which are entirely different to anything heretofore put upon the market. They inform us that they are in the market for an eight, ten or twelve-foot boring and turning mill.

Light Castings for Furniture Trimmings.

Replying to a question as to who are the manufacturers of these articles the Grand Rapids Brass Co. of Grand Rapids, Mich., advise us that this work is in their line and one of which they make a specialty.

H. D. Phelps of Ansonia, Conn., also announces that he is prepared to make castings of this kind.

The Republic Iron & Steel Company has appointed Rogers, Brown & Co. exclusive agents for the sale of the product of the Pioneer (Ala). furnaces, excepting for New York and vicinity.

The Pioneer brand is well known throughout the entire country and has an unsurpassed record for quality and uniformity of grading. It is very popular among customers desiring a strong Southern coke iron.

Standardized Drillings.

The American Foundrymen's Association's Committee on Standardized Drillings desire to report that there are now nearly one hundred and fifty laboratories using its standards. As some of these use more of one sample than another, the committee desire to notify all who have purchased complete sets of three or four bottles, that they can now obtain separate bottles of samples, A, B, C and D for $2.00 each. There are quite a few laboratories that have not yet adopted these standards, and those who are interested in bringing about a greater uniformity of analyses, which these standards are helping to do, will please address any member of the following committee:

THOS. D. WEST,
Chairman, Sharpsville, Pa.
DR. R. MOLDENKE,
Penna. Malleable Co., Pittsburg, Pa.
JAMES SCOTT,
Lucy Furnace, Pittsburg, Pa.
P. W. GATES,
Gates Iron Works, Chicago, Ill.
E. H. PUTNAM,
Moline Plow Co., Moline, Ill.

A curious result of the tremendous advance in the price of steel rails is to be seen in the sale of old rails at above the cost of new ones. The Pennsylvania company contracted some time ago for a lot of steel rails at $18 a ton. It is receiving the rails now and selling the old ones removed as worn out at $25 a ton.

Consumption of Copper.

The consumption of copper in the United States is increasing rapidly. The copper production in this country for ten months in 1899 was 215,201 gross tons, as compared with 195,940 tons for the corresponding period last year. Exports during that period were 87,212 tons, as against 104,652 tons for the first ten months of 1898. The apparent home consumption for the ten months was, therefore, 127,989 tons, as compared with 91,288 tons in 1898, an increase of 40 per cent.

A Mechanic's Job.

The mechanics of the American Pipe and Foundry Company at Bessemer are out on a strike, the cause of which, it is understood to be, that the company put cheap men to trimming pipe after they came from the mold, the work heretofore done by the mechanics themselves. The mechanics, it is said, made a demand that whoever trimmed the pipes should get mechanics' wages. The company refused and the strike followed. Only a small number of the men are affected. The strike of the negro employes at the same plant is still on. Meanwhile the company is running on about three fourths of its normal output.—Montgomery (Ala.) Advertiser.

A Slight Accident.

A slight accident occurred Saturday evening which demolished the mold at the foundry for a large casting. Just as the molten iron was being poured in there was a sound like an explosion, and the air was filled with sand and iron. No one was injured.—Leavenworth (Kansas) Times.

Atlantic, Iowa, is in need of a foundry. Information will be furnished by the Commercial Association of that city.

Size of Snap Flasks.

I would like to ascertain what is the largest sized snap flask for bench work in general use. I have been told that a flask 14"x 16" represented the average, but would like to hear from other portions of the country.

What is the cheapest composition for cores?

WILLIAM McDONALD.

NOTICE!

Advertisements in this column, 30 cents a line for each insertion About seven words make a line. The Cash and Copy should be sent to reach us not later than the 20th to insure publication.

Answers addressed to our care will be forwarded.

TO SUBSCRIBERS

whose names appear on our **subscription** list, we will give one free insertion under this heading to those in want of positions, the advertisement to occupy a space of not more than five lines. Additional space or insertions must be paid for in advance at regular rates.

WANTED—An eight, ten or twelve-foot boring and turning mill. W. A. Jones Foundry and Machine Co., Chicago.

FOR SALE—A No. 2 Roots Blower, almost new. Will be sold cheap for cash. Apply to Turner Machine Co., Danbury, Conn.

FOR SALE—One 3 to 4 ton jib crane, hand power. Blue print and price on application. JAMES LEFFEL & CO., Springfield, Ohio.

BLOWER FOR SALE—One No. 4 Baker Blower, in good order. In use four years. Too small for present cupola. Erie Foundry Co., Rochester, N. Y.

WANTED—A man to take charge of the cylinder work in the foundry of a locomotive building concern. Address "L. W.," Box 343, care THE FOUNDRY.

FOR LEASE—Foundry plant, admirably located in Detroit, in excellent repair; capacity two hundred moulders. Write Michigan Malleable Iron Company, Detroit.

FOR SALE—Cupola; 84-inch diameter, hight from bed plate to top of stack 49 ft. 3 inches. For further particulars address Kansas City Car & Foundry Company, Kansas City, Kansas.

FOR SALE—Second hand. One 63-inch Boston blower, 11-inch outlet, good as new. One 5-ton foundry screw ladle, in good working order. AMERICAN HOIST & DERRICK CO., St. Paul, Minn.

WANTED—An experienced foreman coremaker, capable of handling from thirty to forty men. State age, experience, with references and salary expected. Address "Wilson," Box 357, care THE FOUNDRY.

WANTED—Competent foundry foreman, good moral character, some capital, to buy interest in medium-sized, well-equipped foundry and machine shop. Address "Pennsylvania," Box 361, care THE FOUNDRY.

WANTED—Experienced foundry foreman wishes position where brains are appreciated. Is familiar with heavy and light work, fitting up special rigging, etc. N. E. preferred. Address "X." box 350, care THE FOUNDRY.

WANTED—Foundry foreman of experience and ability for shop making a specialty of Corliss and Slide Valve engines, air compressors, furnace work, heavy and light castings. Address "H.," Box 344, care THE FOUNDRY.

WANTED—Position as superintendent or foreman of stove factory; skilled in the operation of every department; 25 years' experience; first-class melter; sober and reliable. Address "Practical," Box 351, care THE FOUNDRY.

WANTED—Position as foundry foreman, with ten years' experience in heavy and light work; thoroughly posted in mixing iron and handling large forces of men. References furnished. Address "Foreman," Box 356, care THE FOUNDRY.

WANTED—Position as foreman molder, in or near Detroit preferred. Best references as to molding, melting and mixing brass, bronze and copper castings of any class and weight from all known formulas. Address "Bronze," Box 352, care THE FOUNDRY.

WANTED—By experienced chemist and metallurgist, position with blast furnace, grey iron or malleable foundry. Specialty, malleables on scientific principles. Graduate of university; 14 years' practical experience. Address "Chemist," Box 353, care THE FOUNDRY.

WANTED—Foreman for stove foundry of about forty molders, located in one of the central states. Want a sober, industrious mechanic, that can handle men and make good, smooth stove plate. State age, references and salary expected, to "Admiral," Box 360, care THE FOUNDRY.

WANTED—A first-class foundry foreman, who understands the handling of Corliss engine work and heavy castings of a similar character, together with the small work which accompanies same. A good position for the right man. Address "Corliss," Box 358, care THE FOUNDRY.

WE ARE ENLARGING our foundry plant and will shortly require the services of a large number of competent molders. We invite applications from men who are skilled in large work made in green and in dry sand. Apply by letter. THE WESTINGHOUSE MACHINE COMPANY, East Pittsburg, Pa.

WANTED—Malleable furnace man. A practical man capable of taking charge of air furnaces in malleable shop. Must be competent to keep furnaces in repair and run economically. Western location. Address, giving experience, age and wages expected, "Western," Box 359, care THE FOUNDRY.

WE ARE IN the market for some stove patterns. We wish a neat medium-priced range, sizes 7 and 8, with waterback and attachments; also a light or medium weight No. 7 and 8 cook. Possibly we will want these patterns filed, fitted and followboarded. AVONDALE STOVE & FOUNDRY CO., Avondale, Alabama.